NEXCOM-OCT-TP-06

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

Final Test Plan

for the

Multimode Digital Radio

Operational Capabilities Test (OCT)

October 4th, 2000

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1.0 Introduction

The Next Generation Air/Ground Communication (NEXCOM) System Multimode Digital Radio (MDR) procurement will serve to sustain existing Double Side Band Amplitude Modulation (DSB-AM) transmitters and receivers until the infrastructure to support Aeronautical Telecommunication Network (ATN) Very High Frequency (VHF) Digital Link (VDL) Mode 3 communications is implemented.

The MDR acquisition is intended to be a competitive, Non-Developmental Item (NDI) procurement. An Operational Capabilities Test (OCT) of each Offeror's proposed MDR subsystem(s) will be conducted prior to contract award. The OCT will serve as an integral element of the technical evaluation and source selection process.

1.1 Background

The current Air/Ground (A/G) radio system consists of voice-based networks that use DSB-AM radios. The demand for additional frequency capacity (to support a variety of new services and the existing A/G communications needs) led to the development of the NEXCOM Program. Procurement and implementation of NEXCOM will be accomplished through a segmented-program approach supporting a "seamless" transition to ATN services without disruption to the present voice-based service. The first segment consists of the MDR operating in DSB-AM mode as a sustainment radio. Gradually, the MDRs will be transitioned to VDL Mode 3 communications as the NEXCOM sub-network is implemented.

1.2 Purpose of the Test Plan

This test plan delineates the OCT philosophy, concept, and requirement verification approaches. It also identifies the MDR test configurations, personnel roles, and related OCT activities. Each Offeror's MDR will be evaluated to functionally characterize and verify that the MDR operates as specified in FAA-E-2938, Subsystem Specification for the Multimode Digital Radio; FAA-E-2944, Multimode Digital Radio (MDR) Maintenance Data Terminal (MDT) Maintenance Application Software Requirements Specification; and NAS-IC-41033502, Interface Control Document for the Multimode Digital Radio/Radio Interface Unit.

1.3 Scope of the Test Plan

The plan covers all planning aspects for the conduct of the NEXCOM MDR OCT. Specifically, this plan identifies the methods for verifying each requirement, the roles and responsibilities of both the MDR Offeror and FAA, the schedule of OCT events, and high level descriptions of the MDR OCT Test Bed. As applicable, this plan follows the content and format of the FAA Acquisition Management System (AMS) Test and Evaluation (T&E) Process Guidelines.

2.0 Reference Documents

The following documents form a part of this document to the extent specified herein. Other documents referenced in this plan are directly referenced in FAA-E-2938, FAA-E-2944, or NAS-IC-41033502.

AMS-T&E	Acquisition Management System Test and Evaluation Process Guidelines, December 1999.
FAA-E-2938	Subsystem Specification for the Multimode Digital Radio
FAA-E-2944	Multimode Digital Radio (MDR) Maintenance Data Terminal (MDT) Maintenance Application Software Requirements Specification
NAS-IC-41033502	Interface Control Document for the Multimode Digital Radio/Radio Interface Unit

3.0 System Description

The units to be tested are the OCT Transmitter (15 watt and 50 watt) and OCT Receiver. The OCT transmitter(s) and OCT receiver are "pre-production" MDRs that the MDR Offeror submits for OCT evaluation in accordance with the NEXCOM MDR Screening for Information Request (SIR). For this plan, the term "MDR" is used to refer to either an OCT receiver, OCT transmitter (15 watt or 50 watt), or both. The following subsections provide an overview of the "production" MDR and its current and future operation within the NAS.

3.1 System Overview

Initially, the MDR will operate as a 25-kilohertz (kHz) DSB-AM analog radio. This mode of operation is needed to support current Air Traffic Control (ATC) voice operations. As the FAA starts its conversion to the NEXCOM concept for A/G communications, the MDR will operate in the VDL Mode 3. VDL Mode 3 uses Time Division Multiple Access (TDMA) techniques enabling multiple users to share the same frequency for the exchange of both voice and data information. The MDR functionality is defined in FAA-E-2938. Figure 1, MDR (DSB-AM Radio) with Co-located Transmitter/Receiver, shows a possible initial physical-connection configuration for the MDR units. Figure 2, VDL Mode 3 Co-located Transmitter/Receiver, shows a possible VDL Mode 3 Configuration.

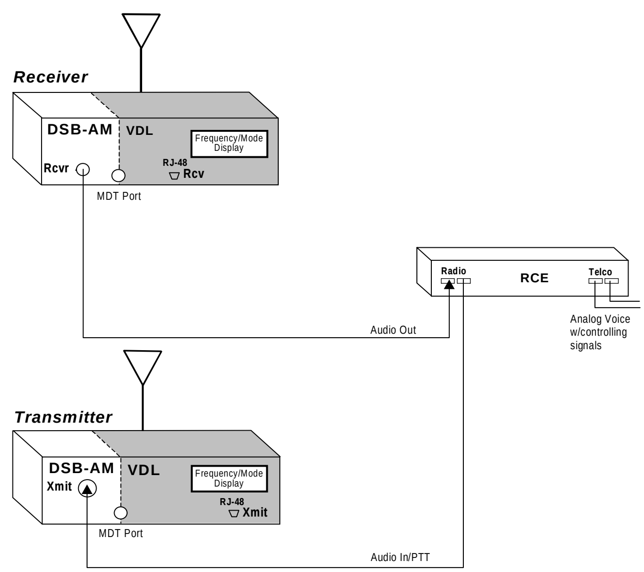

Figure 1. MDR (DSB-AM Radio) with Co-located Transmitter/Receiver

3.2 Interfaces Overview

The MDR unit has several interfaces in both DSB-AM and VDL Mode 3 operation. These interfaces are as follows:

- DSB-AM
  1. MDT Interface
  2. Human Interfaces (microphone, headset, front panel display, etc.)
  3. Control/Audio Interfaces (Radio Control Equipment (RCE), Tone Control, ground keying, etc.)
  4. Antenna Interface

- VDL Mode 3
  1. MDT Interface
  2. Human Interfaces (microphone, headset, front panel display, etc.)
  3. Radio Interface Unit (RIU) Interface (Control/Audio/Remote Maintenance Monitor (RMM) capabilities via standard fraction T1 ports)
  4. Antenna Interface

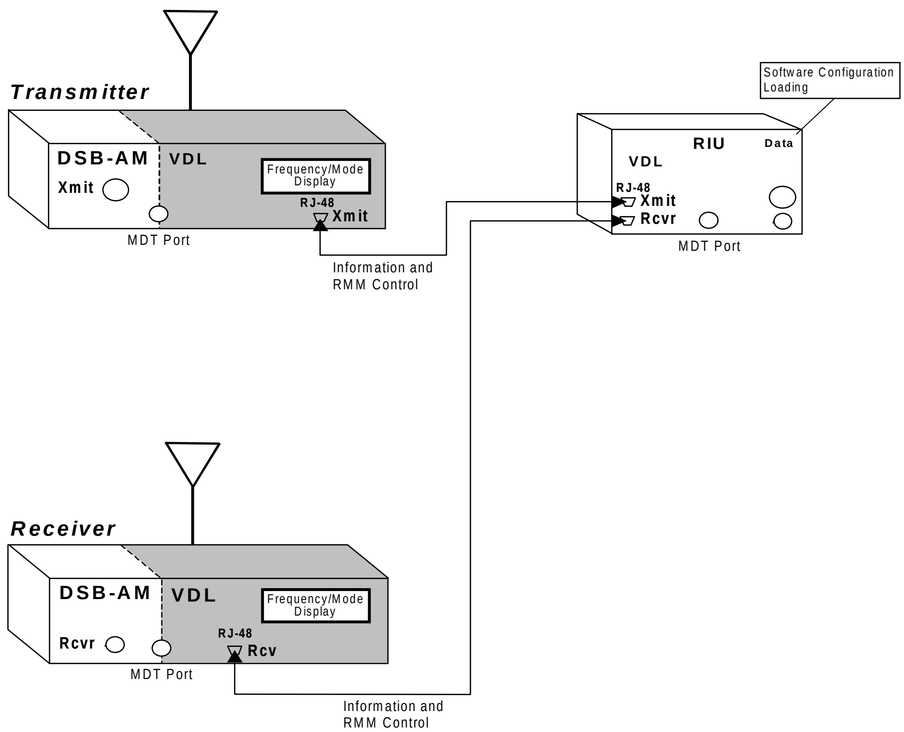

Figure 2. VDL Mode 3 Co-located Transmitter/Receiver

As indicated above, the major interface change between the DSB-AM and VDL Mode-3 operations is the control and audio interfaces. Physical and operational specifics of the control and audio interfaces for the DSB-AM and VDL Mode 3 operation are defined in the FAA-E-2938. Design characteristics of the MDR/RIU interface are contained in NAS-IC-41033502.

4.0 Test Program Description

Multimode digital radio testing consists of pre-contract award and post-contract award T&E programs. This document describes the framework of the pre-contract award OCT program.

4.1 Approach and Concept

The OCT consists of verifying each Offeror's MDR for compliance with FAA-E-2938, FAA-E-2944, and NAS-IC-41033502. This verification process will utilize application specific automated test tools located in NEXCOM laboratories at the William J. Hughes Technical Center (WJHTC). Automated Test Equipment (ATE) operating under software control will provide, radio control equipment emulation, radio emulation; test equipment control; and automatic data collection such that all candidates (i.e. MDRs) can be evaluated in an identical manner. The ATE will be programmed to execute standard test cases on a Test Bed in a laboratory environment. This will ensure the stability, reliability, consistency, and repeatability of the evaluation process.

A series of manual tests, inspections, demonstrations, and analyses will verify compliance with selected MDR requirements not assessed as ATE candidates. Appendix B, OCT Test Case Descriptions, delineates the verification process approaches for pre-contract award MDR requirement evaluation. Manual tests will be conducted at the WJHTC by the OCT Test Team in either the NEXCOM Radio Laboratory or the NEXCOM Integration Laboratory. Manual tests will be those that do not lend themselves to the ATE environment. For the demonstrations, the Offeror will operate and manipulate their MDRs to show compliance to selected requirements. The Offeror demonstrations will be conducted in the NEXCOM Integration Laboratory and witnessed by the FAA. For analysis verification, the FAA will review Offeror analysis documentation to be provided for selected requirements. Analysis documentation review and evaluation will be performed at FAA headquarters.

4.1.1 Evaluation Approach

The test data will be examined to determine a quantitative evaluation of each Offeror's MDR. Test data will be collected from the OCT through the use of test data sheets (TDSs) and data logs on the ATE controlling computer. The data logs will be reviewed, reduced, and analyzed. The results of the data logs will be recorded on the TDSs. All anomalies will be recorded on Discrepancies Sheets. The TDSs and Discrepancy Sheets will be compiled into a Requirements Compliance Report (RCR). Each requirement will be cross referenced to the TDS and/or Discrepancy Sheets and a determination will be included in the test report as to whether the Offeror's MDR did or did not comply with each requirement. The RCR will then be provided to the Technical Evaluation Team (TET) for inclusion in the Source Selection Process.

4.1.2 Activities Leading to Test

An Operational Capabilities Demonstration (OCD) was conducted at the Offeror's facility as a pre-qualification for MDR OCT. Only qualified Offerors (determined by successfully passing the OCD) are invited to submit proposed MDRs for OCT.

4.2 Test Environment

All testing activities for the MDR OCT will be conducted at the WJHTC at the following on site locations:

a) NEXCOM Integration Laboratory, Building #300, second floor. Offeror Demonstrations, and Physical Tests will be conducted in the NEXCOM Integration Laboratory. Manual tests may also be performed in the NEXCOM Integration Laboratory. Two standard 19” racks and AC power will be available to the Offeror for the conduct of the Offeror Demonstrations and familiarization training. All test equipment and interfacing cables to the test equipment for the demonstrations and training will need to be provided by the Offeror. In addition, two 2´ by 4´ tables will be available to the Offeror for the conduct of demonstrations and training.

b) NEXCOM Radio Laboratory, Building #70. The automated and manual tests will be conducted at the NEXCOM Radio Laboratory. The Radio Laboratory will contain the OCT Test Bed described in Section 5.3.1 and bench test space for manual tests. All test equipment to conduct the automated and manual tests will be provided by the FAA and housed in the Radio Laboratory.

4.3 Test and Analysis Tools

The OCT Test Bed is comprised of a Personnel Computer (PC) that will collect test data and provide a disk-based recording of the testing process. The following data reduction and analysis tools will be used to evaluate data and support the testing:

- Microsoft Excel
- LabWindows©

4.4 Test and Evaluation Descriptions

The MDR OCT is comprised of seven (7) functional T & E categories. The functional categories are subdivided into test cases for MDR requirements verification. Each MDR OCT test case will help to verify the requirements as listed in Appendix A, OCT Verification Requirements Traceability Matrix (VRTM).

4.4.1 Functional Test & Evaluation Categories

Figure 3, MDR OCT Test Categories, depicts the seven functional test & evaluation categories engineered to support the MDR OCT. A description of the seven categories along with a figure illustrating the associated test cases is described in the following sections.

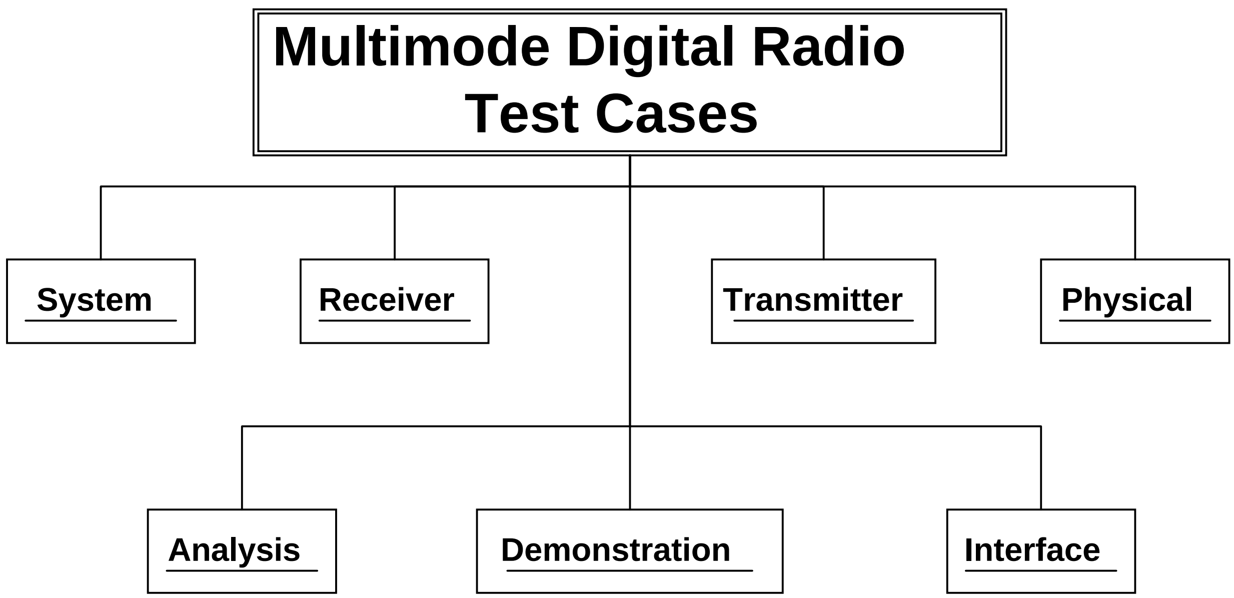

Figure 3. MDR OCT Test Categories

4.4.1.1 System Test

4.4.1.1.1 Test Description

The Offeror's MDR transmitter(s) and MDR receiver will be tested to verify system level requirements. Types of requirements that the associated test cases will verify include transmitter Antenna Transfer Relay (ATR), MDR electrical input power, and other MDR electrical features.

4.4.1.1.2 Functional Flow

Figure 4 depicts all test cases that are allocated to the System Tests.

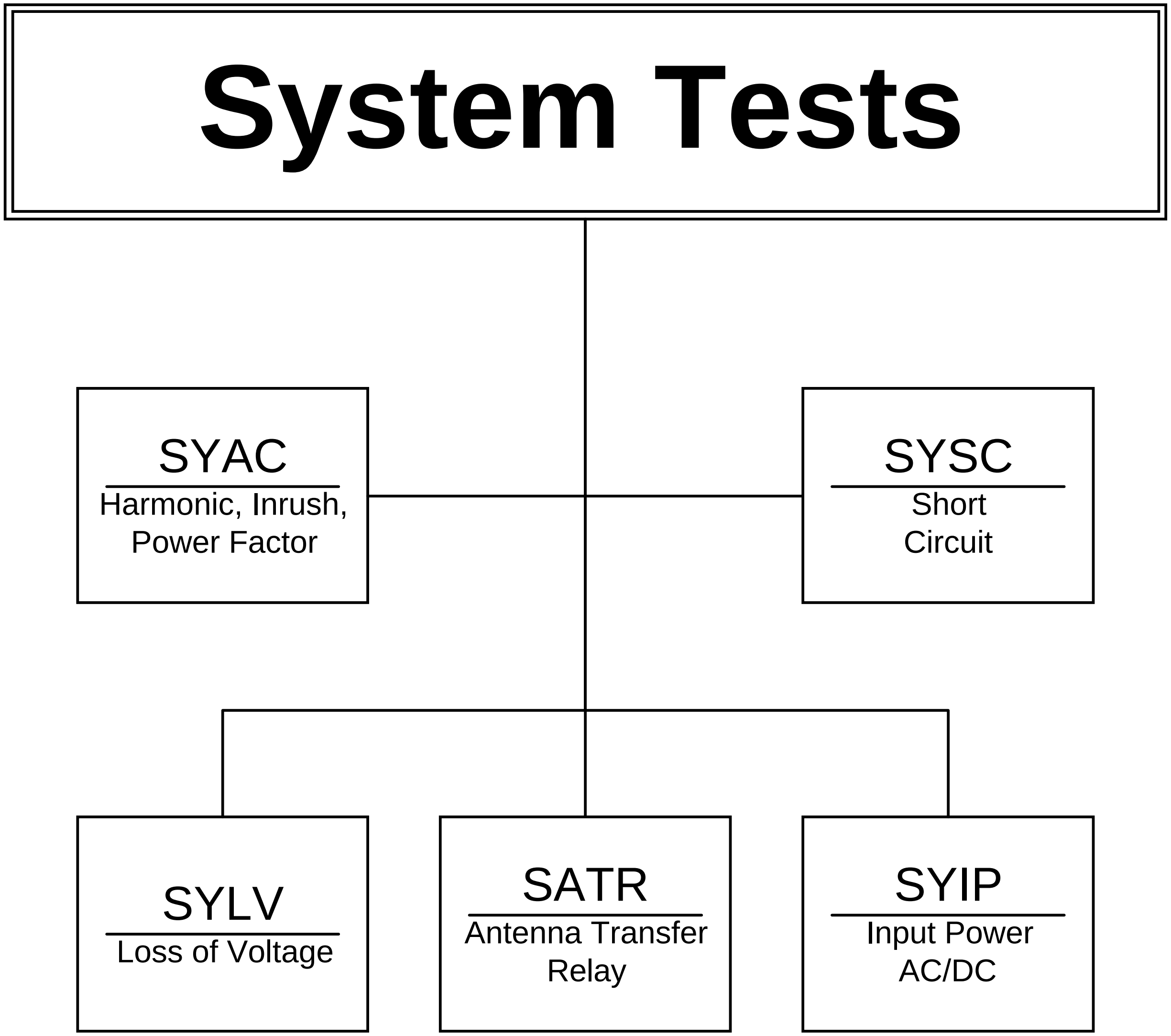

Figure 4. System Test Cases

4.4.1.2 Receiver Test

4.4.1.2.1 Test Description

The Offeror's MDR receiver will be tested in the OCT Test Bed utilizing a Transmitter Emulator, some specialized test equipment (i.e. Signal Generator, Radio Frequency (RF) Analyzer, Audio Analyzer), automated software, and data recording equipment. Types of requirements that will be verified include sensitivity, adjacent channel rejection, intermodulation, collocation, dynamic range, and Automatic Gain Control (AGC) stabilization. Certain test cases will be executed for both the DSB-AM and the VDL Mode 3 to verify requirements.

4.4.1.2.2 Functional Flow

Figure 5 depicts all test cases that are allocated to the Receiver Tests.

4.4.1.3 Transmitter Test

4.4.1.3.1 Test Description

The Offeror's MDR transmitter(s) (15 watt and 50 watt) will be tested in the MDR OCT Test Bed utilizing a Receiver Emulator, some specialized test equipment (i.e. RF Power Meter, RF Analyzer, Audio Analyzer), automated software, and data recording equipment. Types of requirements that will be verified include spectral mask, intermodulation, continuous operation, and harmonic output. Certain test cases will be executed for both DSB-AM and the VDL Mode 3 to verify requirements.

4.4.1.3.2 Functional Flow

Figure 6 depicts all test cases that are allocated to the Transmitter Tests.

4.4.1.4 Physical Test

4.4.1.4.1 Test Description

The Offeror's transmitters and receiver will be primarily inspected during the execution of the physical tests. Types of requirements that will be verified include: connectors; controls; size and weight; labeling; and installation/removal.

4.4.1.4.2 Functional Flow

Figure 7 depicts all test cases that are allocated to the Physical Tests.

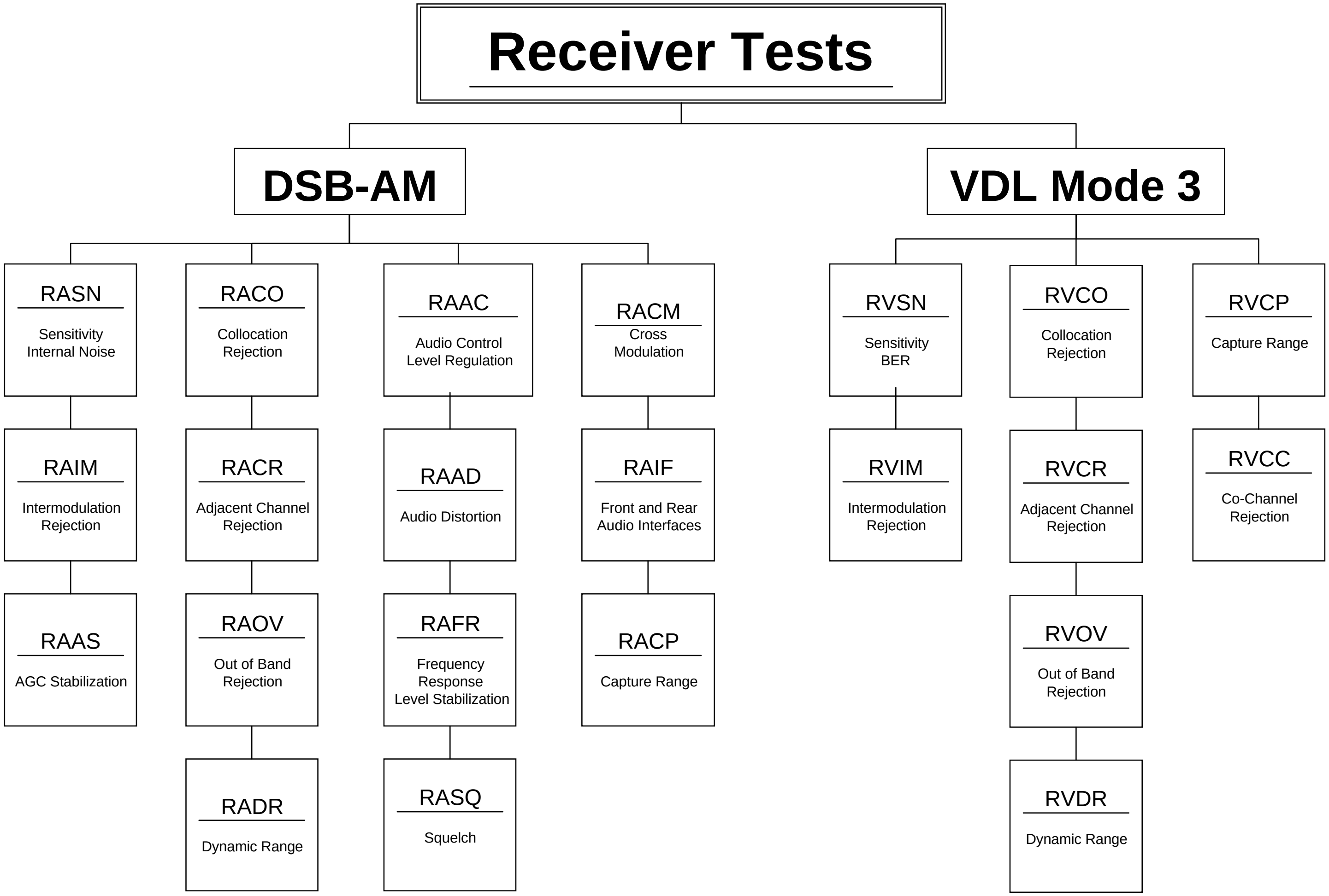

Figure 5. Receiver Test Cases

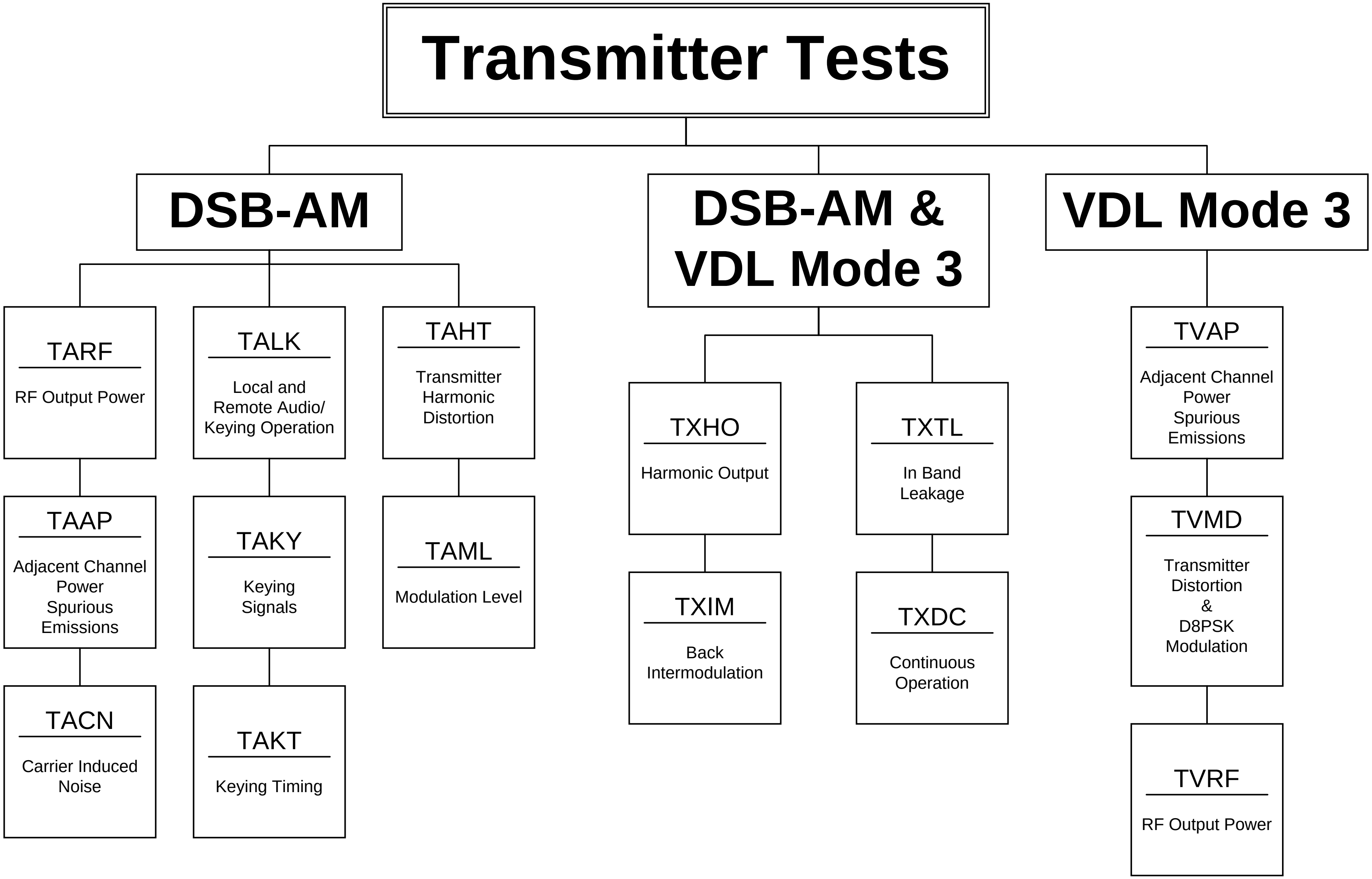

Figure 6. Transmitter Test Cases

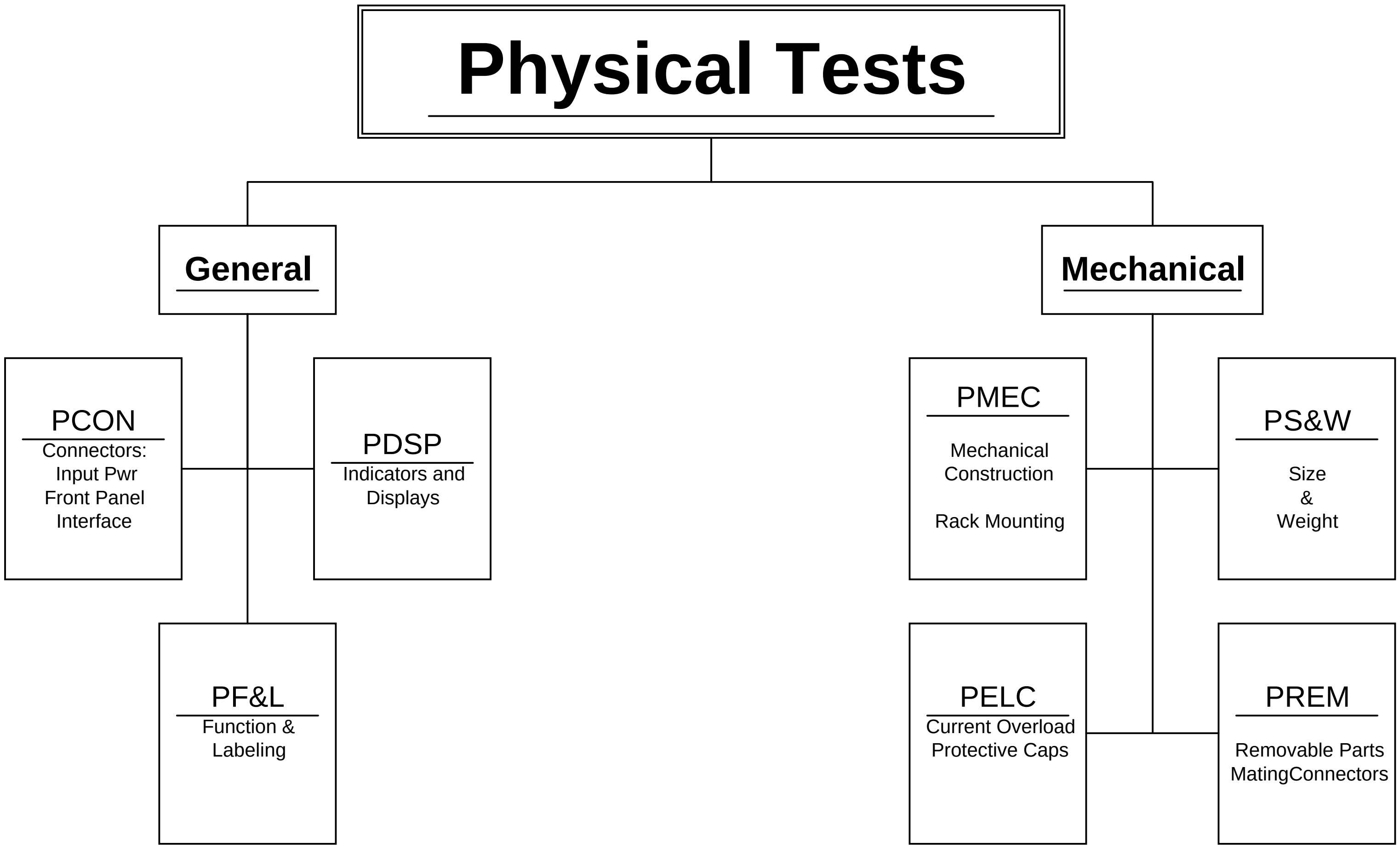

Figure 7. Physical Test Cases

4.4.1.5 Analysis Test

4.4.1.5.1 Test Description

The requirements allocated to these test cases will be reviewed and analyzed by the TET. Types of requirements allocated to these test cases include: operating conditions; Electro-Magnetic Capability (EMC); Electro-Static Discharge (ESD); Mean-Time-Between Failures (MTBF); Mean-Time-To-Repair (MTTR); and human factors engineering. To validate these requirements, the Offeror will be required to produce a White Paper or a Data Analysis Report which delineate how the Offeror's MDR meets the associated requirement.

4.4.1.5.2 Functional Flow

Figure 8 depicts all test cases that are allocated to the Analysis Tests.

4.4.1.6 Demonstration Test

4.4.1.6.1 Test Description

The Offeror will demonstrate to the OCT team his equipment's compliance to selected requirements. The requirement types for demonstration are divided into two areas:

- Monitoring and Control requirements that include, but are not limited to: control and monitoring of transmitter and receiver parameters, data security, and data storage.
- MDR requirements, which include, but are not limited to: receiver selectivity, MDR frequency tuning capabilities, and MDR warm up/set up times.

The FAA RIU Simulator will not be available for the Demonstration Tests. Operation of a separate 50 watt transmitter is only required for Test Case DMPO.

4.4.1.6.2 Functional Flow

Figure 9 depicts all test cases that are allocated to the Demonstration Tests.

4.4.1.7 Interface Test

4.4.1.7.1 Test Description

An RIU Simulator and T1 framer will be utilized to verify requirements allocated to these test cases. Types of requirements to be verified include Control and Monitoring data formats, Interface Messages, Data Link Layer, and T1 Framing.

4.4.1.7.2 Functional Flow

Figure 10 depicts all test cases that are allocated to the Interface Tests.

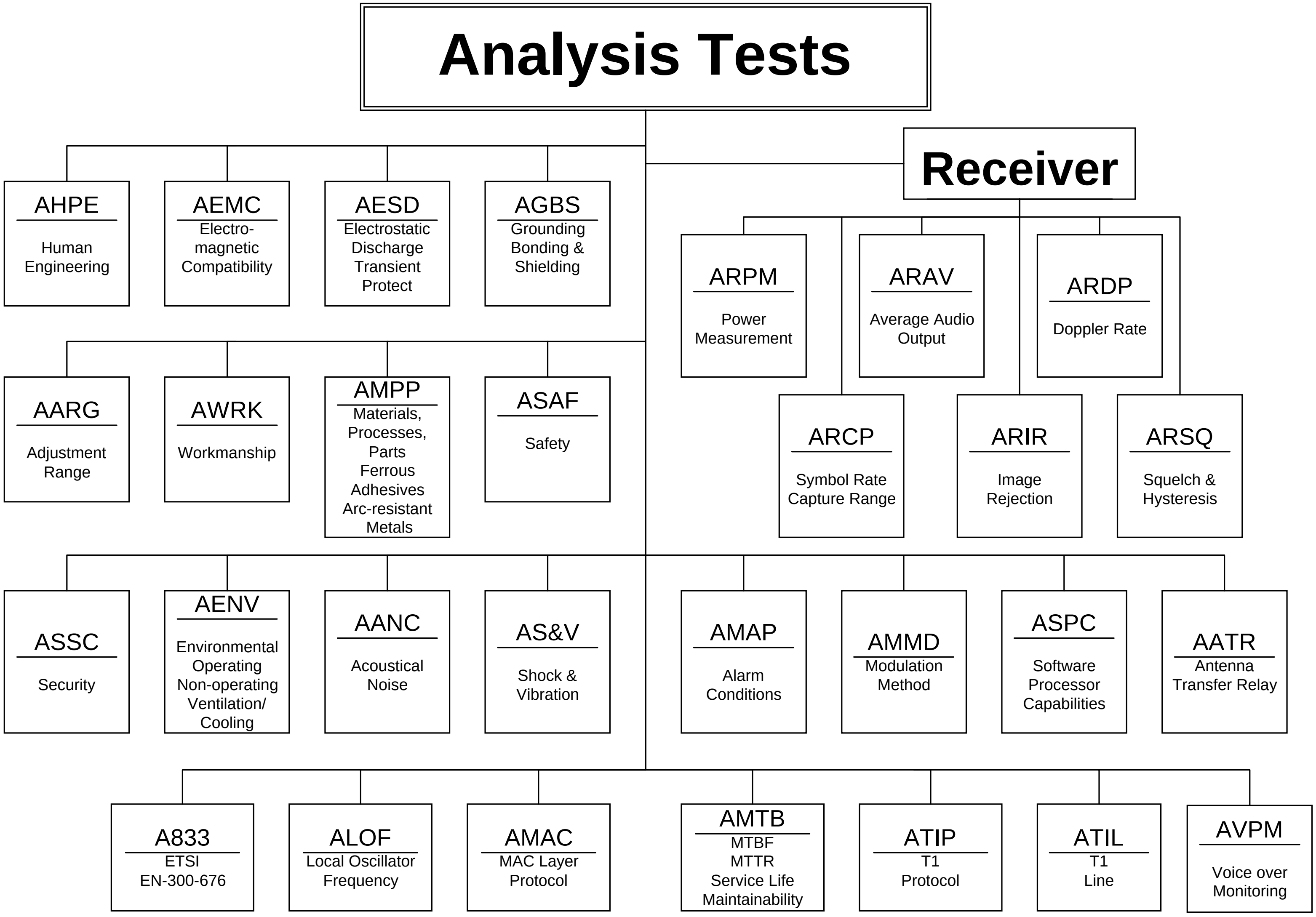

Figure 8. Analysis Test Cases

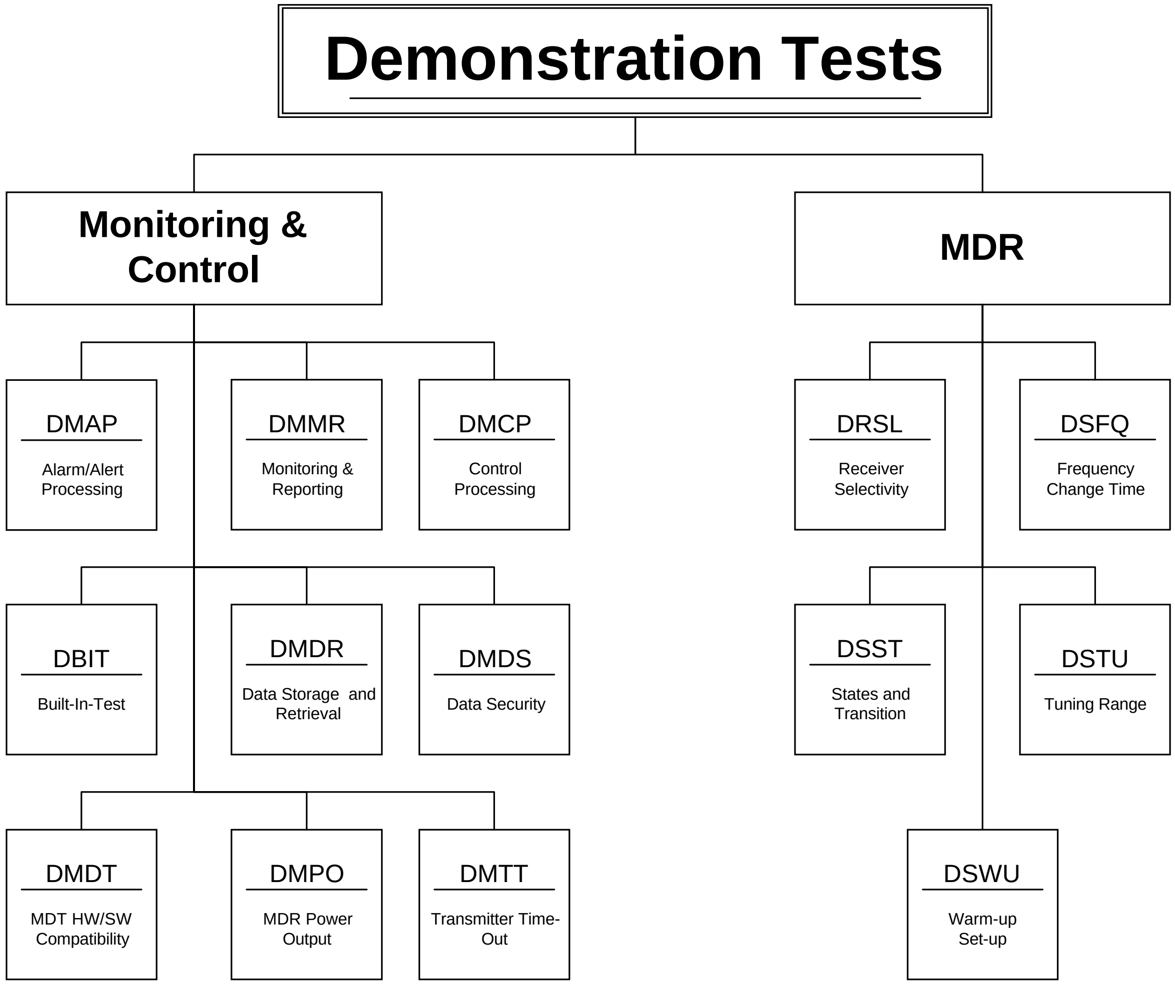

Figure 9. Demonstration Test Cases

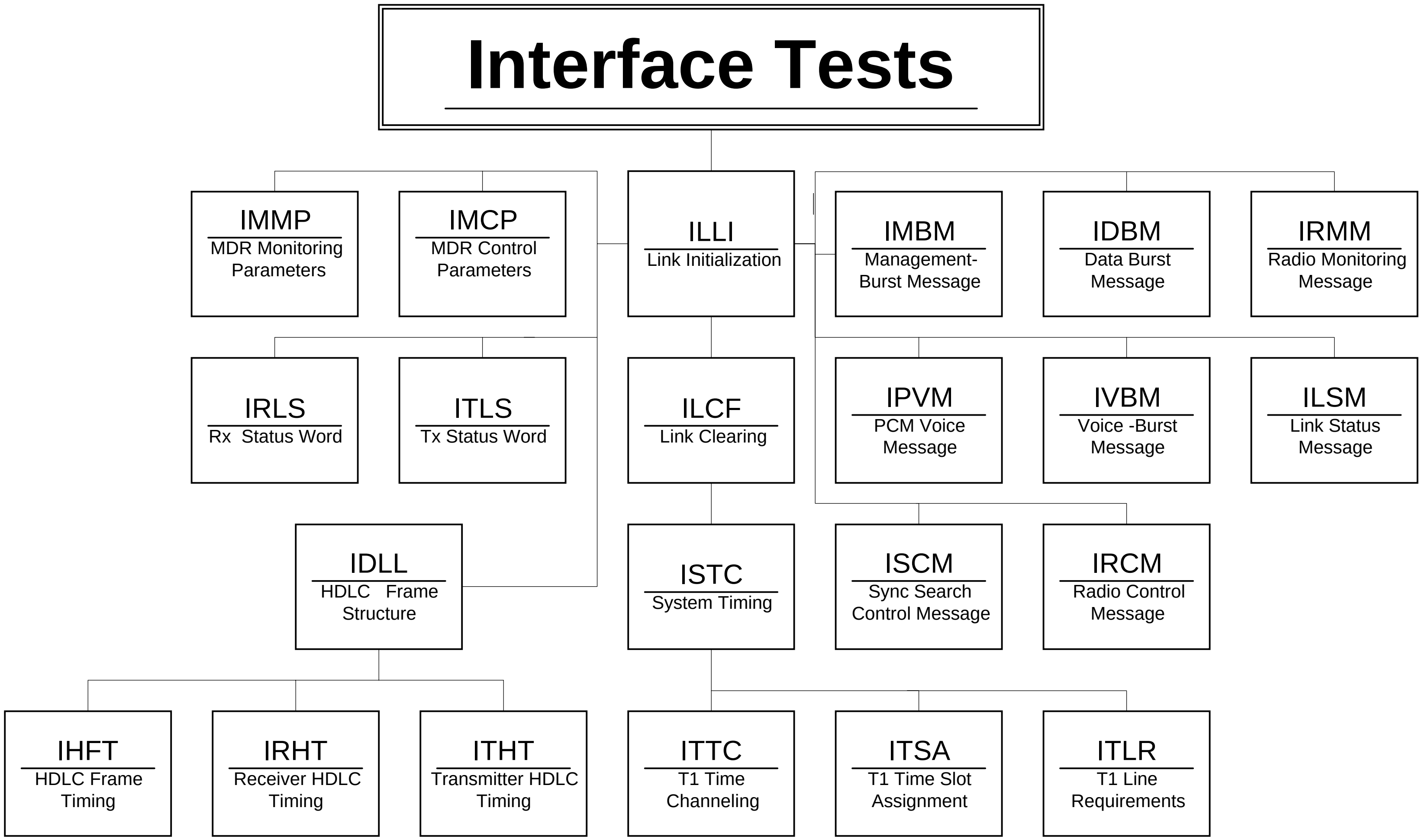

Figure 10. Interface Test Cases

4.4.2 Verification Requirements Traceability Matrix

The OCT VRTM contained in Appendix A provides a cross-reference from each FAA-E-2938, FAA-E-2944, and NAS-IC-41033502 requirement to the OCT test method(s) and the test case(s). All crossovers in test method and test cases for a requirement are noted in the VRTM and in the individual test cases. A brief description of each test method is given below:

a. Test (T). Test is a method of verification wherein performance is measured during or after the controlled application of functional and/or environmental stimuli. Quantitative measurements are analyzed to determine the degree of compliance. For the purposes of the MDR OCT, all tests will be performed by the FAA at the WJHTC. The testing may be either automated or manual.

b. Demonstration (D). Demonstration is a method of verification where qualitative determination of properties is made for an end-item, including software and/or the use of technical data and documentation. The items being verified are observed in a dynamic state with the degree to which quantitative measurements (available for Government review and validation) are subject to Offeror discretion. For the purpose of the MDR OCT, all demonstrations will be performed by the MDR Offeror and witnessed by the FAA at the WJHTC.

c. Analysis (A). This method of verification consists of comparing hardware or software design with known scientific and technical principles, procedures, and practices to estimate the capability of the proposed design to meet the mission and system requirements. This will be accomplished by the FAA review of technical data either collected by the Offeror and compiled into a data analysis report and/or a “White Paper” prepared by the Offeror against specific requirements. For the purposes of the MDR OCT, all analysis documentation will be provided by the MDR Offeror as part of his technical proposal submittal and will be evaluated by the TET at FAA Headquarters.

d. Inspection (I). Inspection is a method of verification to determine compliance without the use of special laboratory appliances, procedures, or services, and consists of a non-destructive static-state examination of the hardware or software. For the purposes of the MDR OCT, all inspections will be performed by the FAA at the WJHTC.

e. Verified by Lower Level Requirement (LL). This indicates that higher level requirement is verified by testing a multitude of lower-level requirements. When possible, the lower level requirements will be identified in the remarks.

f. Not Tested (NT). This indicates that a specific requirement will not be evaluated. For the MDR OCT, this method generally applies to a limited number of NAS-IC-41033502 requirements.

4.4.3 Test Case Descriptions

Appendix B provides a detailed description of each test case grouped by test function. An alpha nomenclature is used to identify each test case. A brief description of the contents of Appendix B for each test case is given below:

4.4.3.1 Test Objectives

This section of the test description states the test case objectives and requirements that are being evaluated.

4.4.3.2 Test Criteria

This section of the test description defines the success criteria for the test case objectives and requirements.

4.4.3.3 Test Approach

The test approach states the methods used to evaluate the test criteria. This can include a list of the types of tasks or activities that will occur, the specific test conditions, or special operational situations that may occur in the test.

4.4.3.4 Data Analysis Methods

This section of the test description states the methods and analysis tools used to accomplish data reduction for each test case.

5.0 Test Management

This section will provide the overall test management requirements and details for the conduct of the MDR OCT.

5.1 Test Management Organization

The MDR OCT testing will be conducted by the WJHTC's Communications Infrastructure Branch, ACT-330. ACT-330 is responsible for managing the development, testing, and utilization of the MDR OCT Test Bed and ensuring the OCT activities adequately test each Offeror's MDR transmitter(s) and MDR receiver. Figure 11, MDR OCT Test Organization, identifies the OCT personnel resources.

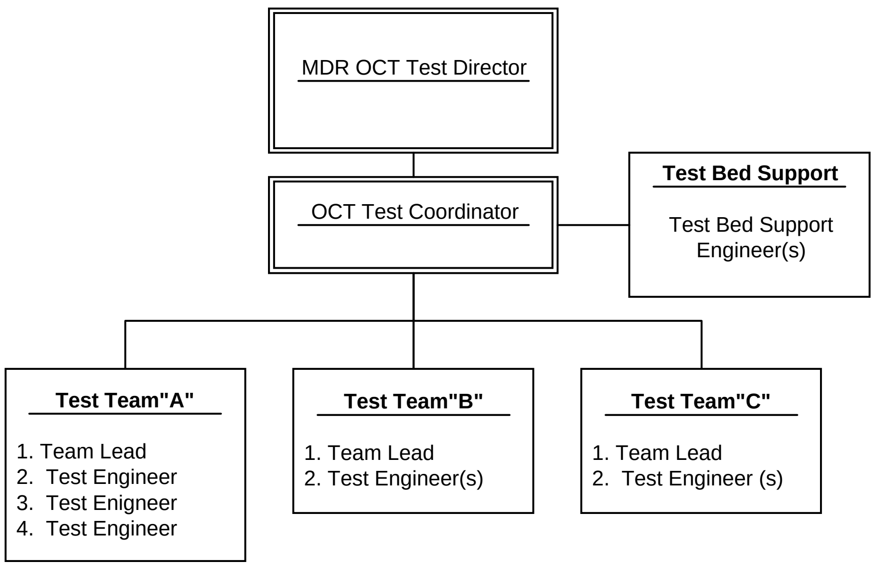

Figure 11. MDR OCT Test Organization

5.1.1 Roles and Responsibilities

This section identifies the various organizations and personnel that will conduct and support the OCT testing.

5.1.1.1 Test Director

The MDR OCT Test Director is responsible for overseeing all OCT testing. Additional responsibilities include coordination of all testing activities with the FAA NEXCOM Technical Program Manager and the MDR OCT Test Coordinator. In addition, the test director is responsible for defining the overall schedule and milestones for OCT testing.

5.1.1.2 OCT Test Coordinator

The OCT Test Coordinator serves as the FAA Point-of-Contact (POC) on all OCT related activities while the Offeror's subsystem is evaluated at the WJHTC. The test coordinator's responsibilities include receiving and logging the OCT equipment from the Offeror, contacting Offeror representative(s) during OCT testing, scheduling/rescheduling the daily OCT test activities, and reporting (where appropriate) the test results to the MDR OCT Test Director, the TET, and Contracting Officer. The OCT Test Coordinator will also make the final determination on test results when conflicts or discrepancies occur.

5.1.1.3 OCT Test Bed Support Engineers

OCT Test Bed engineers will be used to maintain and troubleshoot the OCT Test Bed. They will only participate on an as needed basis. They will not be involved in the evaluation of the Offeror's MDR as part of the OCT.

5.1.1.4 OCT Team Lead

The OCT Team Leads are responsible for ensuring that the MDR OCT Test Procedures are followed and that data is collected as specified for data reduction and analyses, identification and documentation of problem areas, and the preparation of required documentation and test reports. The Team Leads gather the information from the various Test Engineers under their direction and report the results of the daily OCT test activities to the Test Coordinator. The Team Leads are also required to perform all functions of the OCT Test Engineers.

5.1.1.5 OCT Test Engineers

The OCT Test Engineers are primarily responsible for executing the test case procedures. Additional activities include preparation of the OCT Test Bed configuration for each test case, providing results of all verification efforts, analyses, inspections, and operational status throughout the OCT tests. The test engineers will receive training on the following:

a. Operation of the OCT Test Bed

b. Operation of the Offeror's MDR

Test engineers will also receive training and have knowledge of the following:

a. OCT Test Bed Data Collection Tools

b. MDR OCT Test Plan and Procedures

c. MDR OCT Test Data Sheets

d. MDR OCT Deficiency Reports

e. Security Procedures

5.1.2 Other Participating FAA Organizations

As necessary, members of the A/G Communications Product Team (PT) may be requested to assist in the development, planning, and execution of the OCT. The level of their support will be coordinated with the MDR Acquisition and TET Leads.

5.1.3 Offeror Roles and Responsibilities

During the preparation and conduct of the OCT, **the Offeror shall maintain a single POC** with the FAA's OCT Test Coordinator. The Offeror representatives will not witness FAA conducted testing, inspections, and analysis performed by the OCT team. The Offeror representatives will be available to answer technical questions concerning the design and performance of their subsystem(s) under evaluation. The Offeror representatives must be at the WJHTC within 30 minutes of being requested during the conduct of their OCT. It is requested that the Offeror provide at least two representatives, but not more than four, for the OCT evaluation.

5.1.3.1 "Submission for OCT" Equipment

The Offeror shall deliver the following items as the "Submission for OCT":

a. Three OCT MDR receivers.

b. Three 15 watt OCT MDR transmitters.

c. Two 50 watt OCT MDR transmitters. These two units are not required if: the Offeror supplies three OCT transmitters that provide the combined functionality of both the 15 watt and 50 watt transmitter (i.e. a 2 watt to 50 watt single enclosure unit) for item b. above.

d. Interface Cables as defined in Section 5.1.3.1.1.

e. Three copies of MDT software. The software will be installed on multiple FAA Government Furnished Equipment (GFE) MDTs. One of the three copies shall be provided on 3.5" high-density floppy diskettes (IBM PC format). Two copies shall be provided on CD-ROM.

f. Sufficient number of spares to sustain the Offeror's MDRs during the OCT test period. The quantity of spares to be provided is at the Offeror's discretion. However, additional spares shall not be permitted after the "Submission for OCT" has been received at the WJHTC. Spares are only allowed at MDR unit (transmitter or receiver) level.

g. Two copies of the Offeror's Demonstration Test Scripts.

h. Twelve Copies of the Offeror's OCT Familiarization Training Material.

Note: For OCT, the MDR/RIU Interface Security features are to be exactly the same as required by the Interface Subset Simulator (ISS):

a. USER ID = "jgarvey"

b. *TERMINAL ID = "BHX37DPC8PRMFFKFQQMK69PXY"*

c. *SECURITY TOKEN = 40 octets of 33h followed by 128 octets of CCh*

The following items should be hand carried by the Offeror to the WJHTC and are not considered part of the “Submission for OCT”:

a. All commercial test equipment, hand tools, and specialized test equipment required to install and checkout the MDRs.

b. All commercial test equipment and specialized test equipment (Offeror developed simulators, emulators, non-commercially available test equipment, etc.) required for conduct of the Offeror demonstrations.

c. Two Offeror MDT laptops.

5.1.3.1.1 Interface Connections and Cables

In order to interface with the OCT Test Bed and to ensure that each OCT Test Case can be conducted, the "Submission for OCT" transmitters and receivers must have the following minimum interfaces in place and provide the additional cable assemblies identified:

a. RF connectors as specified in FAA-E-2938, Shall #213. No additional cabling is required for OCT.

b. Electrical Connectors as specified in FAA-E-2938, Shall #214 and #215. The Offeror is to supply all AC and DC power cables required for OCT as specified in FAA-E-2938, Shall #323 and #324.

c. Receiver Remote Connector as specified in FAA-E-2938, Shall #217. The Offeror is required to provide three 10 foot long interface cables that will interconnect the MDR receiver to the FAA’s OCT Test Bed. The physical connectivity to the OCT Test Bed will be via standard 25 pair cable and standard interface block (S66M). Table 1, Interface Cable Terminations, identifies the signals and associated pinouts required. The Offeror cable for each MDR will terminate with a male 25 pair connector.

d. Transmitter Remote Connector as specified in FAA-E-2938, Shall #219. The Offeror is required to provide three 10 foot long interface cables that will interconnect the MDR 15 watt transmitter and two 10 foot long cables that will interconnect the 50 watt transmitter to the FAA’s OCT Test Bed. The physical connectivity to the OCT Test Bed will be via standard 25 pair cable and standard interface block (S66M). Table 1 below identifies the signals and associated pinouts required. The Offeror cable for each MDR will terminate with a male 25 pair connector. *Note: the two cables for the 50-watt transmitters are not required if 2 watt to 50 watt single enclosure units are provided for OCT.*

Table 1. Interface Cable Terminations

Receiver (RX) Signal	Transmitter (TX) Signal	25 Pair Cable Pair	Conn Pin	66 Block
RX-Mute +-	TX-Key-I +	1	26	1
RX-Mute -	TX-Key-I -		1	2
		2	27	3
			2	4
RX-Mute Conf +	TX-Key-V +	3	28	5
RX-Mute Conf -	TX-Key-V -		3	6
		4	29	7
			4	8
SB Conf +	TX-Key Conf	5	30	9
SB Conf -	TX-Key Conf		5	10
		6	31	11
			6	12
		7	32	13
			7	14
		8	33	15
			8	16
		9	34	17
			9	18
RX-Audio +	TX-Audio +	10	35	19
RX-Audio -	TX-Audio -		10	20
		11	36	21
			11	22
		12	37	23
			12	24
		13	38	25
			13	26
		14	39	27
			14	28
		15	40	29
			15	30
		16	41	31
			16	32
		17	42	33
			17	34
		18	43	35
			18	36
		19	44	37
			19	38
		20	45	39
			20	40
		21	46	41
			21	42
		22	47	43
			22	44
		23	48	45
			23	46
		24	49	47
			24	48
		25	50	49
			25	50

e. MDT Connector as specified in FAA-E-2938, Shall #223. For OCT, the Offeror is to supply one 6 foot serial interface cable assembly per MDR unit provided for the "Submission for OCT", except for spares. This cable is for connection between each MDR and a MDT.

f. RIU Connector as specified in FAA-E-2938, Shall #226. For OCT, the Offeror is to supply one 10 foot RJ-48 to RJ-48 cable assembly per each MDR unit provided for the "Submission for OCT", except for spares. Connections must be consistent with those used to interface with the FAA ISS.

The lack of fully functional interfaces and cables listed above could result in failure of a significant number of test cases. The OCT Test Bed will not be modified to adapt to interfaces that are not compliant with FAA-E-2938.

5.1.3.2 Installation and Checkout

The FAA will bring the sealed Offeror's "Submission for OCT" out of storage at the beginning of that Offeror's OCT period. The Offeror shall be responsible for unsealing and unpacking of the "Submission for OCT". The FAA will inventory the "Submission for OCT" to ensure that is it compliant with the Section 5.1.3.1. The Offeror shall then be responsible for the complete installation and checkout of the MDRs into the OCT Test Bed at the NEXCOM Radio Laboratory and in 19" racks at the NEXCOM Integration Laboratory. The Offeror shall ensure that all the MDR units (except spares) are operational before officially notifying the Test Coordinator that the Offeror is ready to proceed with MDR Familiarization Training. No OCT evaluations will occur until the Offeror declares the associated MDR unit under test (UUT) operational.

5.1.3.3 MDR Familiarization Training

The Offeror shall provide the OCT Test Team with adequate familiarization training to sufficiently conduct and facilitate evaluations of the Offeror's MDR. Familiarization training shall be conducted at NEXCOM Integration Laboratory following the installation and checkout of all MDRs as delineated in the OCT schedule. The Government reserves the right to videotape these training sessions. There will be a total of two training sessions; one session in the morning (7 – 12) and one session in the afternoon (1 – 6). Each training session shall be designed to familiarize/train six test engineers within five hours. Each familiarization training session shall consist of at least the following:

a) Basic MDR design review at the functional flow diagram level with emphasis on any issues concerning peculiar Offeror equipment and personnel safety.

b) Introduction/familiarization of the MDT application including logging on, screen familiarization, status logging, etc…

c) RIU Interface security information.

d) Instruction on operational control/monitoring of the MDR via the MDT, including quick reference sheets, and event log formats.

e) Instruction on determination of the operational MDR status via both the front panel and MDT.

f) Instructions and diagrams on the MDR front and rear panel controls, connections, and pin layouts.

g) Step-by-step instruction and documentation on how to perform setup and configuration changes of the MDRs, including tuning the MDR via the MDT, setting the AM power levels, adjusting filter circuits, etc…

h) Review of all operational configurations of the MDRs that are required for full evaluation of the "Submission for OCT". An example would be the fixed tune versus remotely tunable filter configurations.

There shall be twelve paper copies of the OCT Familiarization Training Material provided with the "Submission for OCT". The training material shall, at a minimum, include all of the documentation requested above and shall be designed to provide quick guidance on MDR operation during the conduct of the OCT.

5.1.3.4 Demonstrations

The Offeror will conduct the demonstrations to the OCT Test Team. Guidelines for the development of the Offeror demonstrations are provided in Appendix B-6.

5.1.3.5 Conduct during OCT

The Offeror will be directed by the FAA to make the control adjustments to the MDR, when necessary, during the OCT. The Offeror will be instructed on what adjustments are to be made to the MDR and then will be escorted from the test area prior to execution of the test.

If an anomaly occurs during the Offeror's OCT, the Offeror's POC will be notified by the OCT Test Coordinator. The Offeror shall provide a representative who will be able to address the problem through diagnostics and/or substitution of a spare (if required). Only the spares shipped with the "Submission for OCT" shall be used for replacement of malfunctioning MDRs.

There will be no exchange of information with the Offeror regarding their status in meeting individual requirements or their status in the OCT process. There will also be no exchange of information with an Offeror regarding the status of other MDR Offerors.

5.1.3.6 Re-packing and Removal

At the conclusion of the OCT for each Offeror, the Offeror's representative(s) shall reseal the containers. If at any time during the source selection process the WJHTC requires an Offeror's container(s) be reopened, the Offeror will be contacted. The unsealing and consequential resealing will be coordinated with the Offeror. If the Offeror wishes to seal and/or reseal the containers, that Offeror must provide a representative within five business days of being contacted.

It is the responsibility of Offerors **who are not selected** to arrange, at the Offeror's expense, for return of their "Submission for OCT" within 30 days of the Contract Award date.

5.2 Configuration Management

WJHTC Test Engineers will perform verification of the wiring, testing, and subsequent configuration of the OCT Test Bed prior to the receipt of any Offeror MDR. This includes both a functional configuration audit and a physical configuration audit. The OCT Test Bed will be benchmarked against known standards of voltage, time, frequency, power, etc., and such standards will be readily available for calibration or verification purposes in the event that it is required. Test Engineer(s) will perform System Configuration Management (CM). At the start of each test day, the Test Engineer(s) will verify the status of the OCT Test Bed. A CM checklist will be completed to verify the hardware and software configurations and ensure that the operational status is consistent for each test.

In conjunction with Offeror installation and checkout, the OCT Test Coordinator will inventory the Offeror's "Submission for OCT". Included in this process, the serial numbers, revision levels, and/or software versions for each MDR unit (and MDT software) will be recorded.

All hand carried test equipment by the Offeror will also be logged upon entrance and exit from the NEXCOM Integration and Radio Laboratories. This will be done for security and control purposes.

5.3 Test Bed Configuration

Figure 12, MDR OCT Test Bed Architecture, shows the majority of the physical connections and components of the OCT Test Bed. Most testing activities will be automated and under the control of a PC, which will be situated in a user convenient manner. The OCT Test Bed is designed to be controlled over the IEEE-488.2 bus (see Figure 13, MDR OCT Test Bed – Function Block Diagram). Figure 13 contains most of the functional interfaces, but is not all encompassing. *Note: Figures 12 and 13 are subject to change prior to commencement of OCT.*

Software will be written to control the Test Bed. Interface drivers will be provided through the use of the National Instruments (NI) system of libraries for test equipment where available. The software package will provide modules that are compatible and can be linked into the software.

The suite of test equipment gives the Test Bed the ability to perform a complete audio analysis, timing characterizations, and MDR functional verification as specified in the OCT VRTM.

The Test Bed will accommodate any individual MDR configuration as specified in FAA-E-2938.

The Test Bed contains two power supplies. The AC power supply is a programmable supply that can furnish any voltage up to 300 VAC. The frequency is programmable up to 20 kHz. This provides the programmatic control of the MDR's input power such that all required input voltages and frequencies may be tested. The DC power supply is a 28 volt high current power supply capable of driving the MDR. The DC power supply is fully programmable.

The Test Bed has the capability to perform all tests from the PC in either manual mode or in a fully automatic mode. The PC is also used to collect test data providing a disk-based record of the testing process.

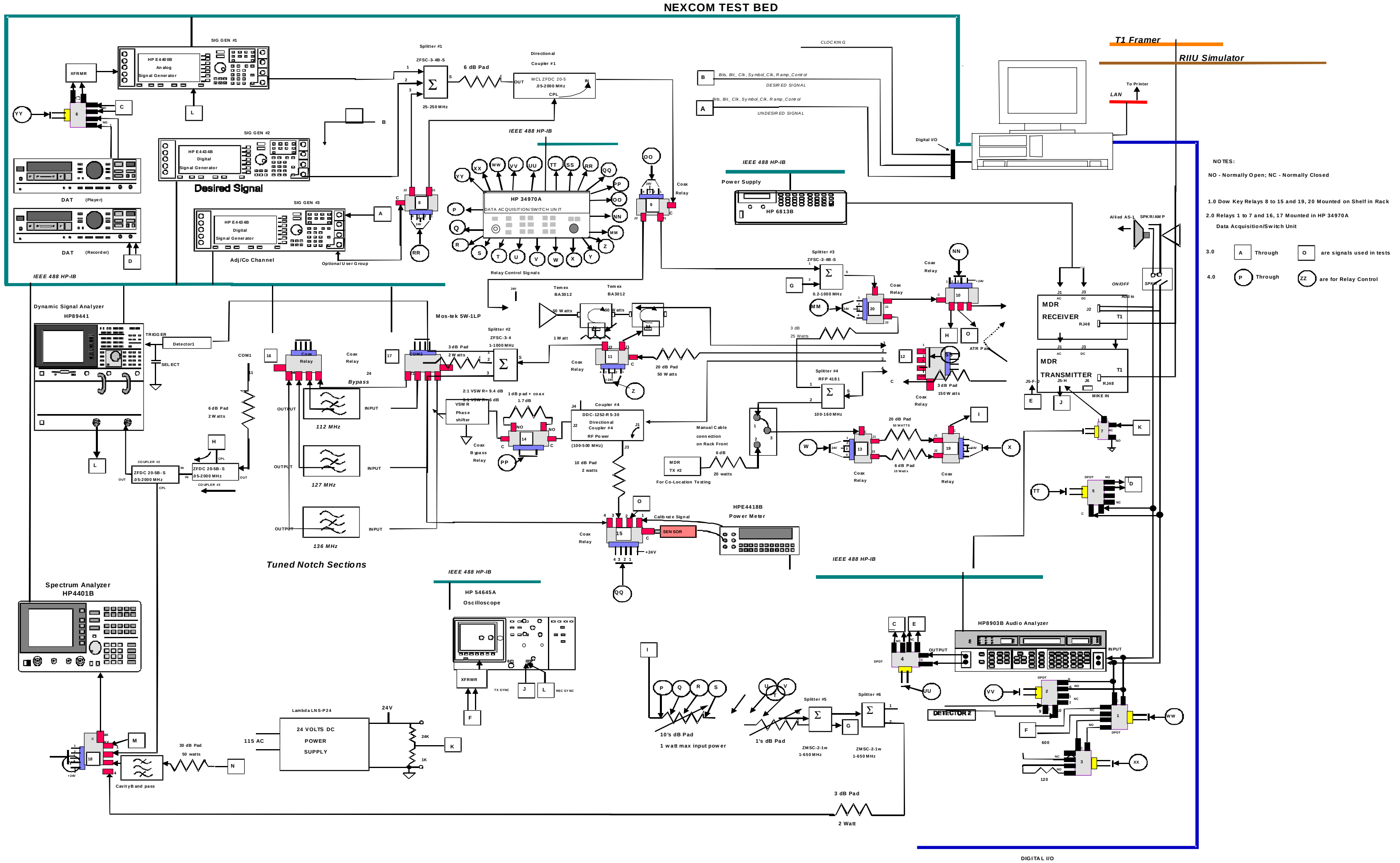

Figure 12. MDR OCT Test Bed Architecture

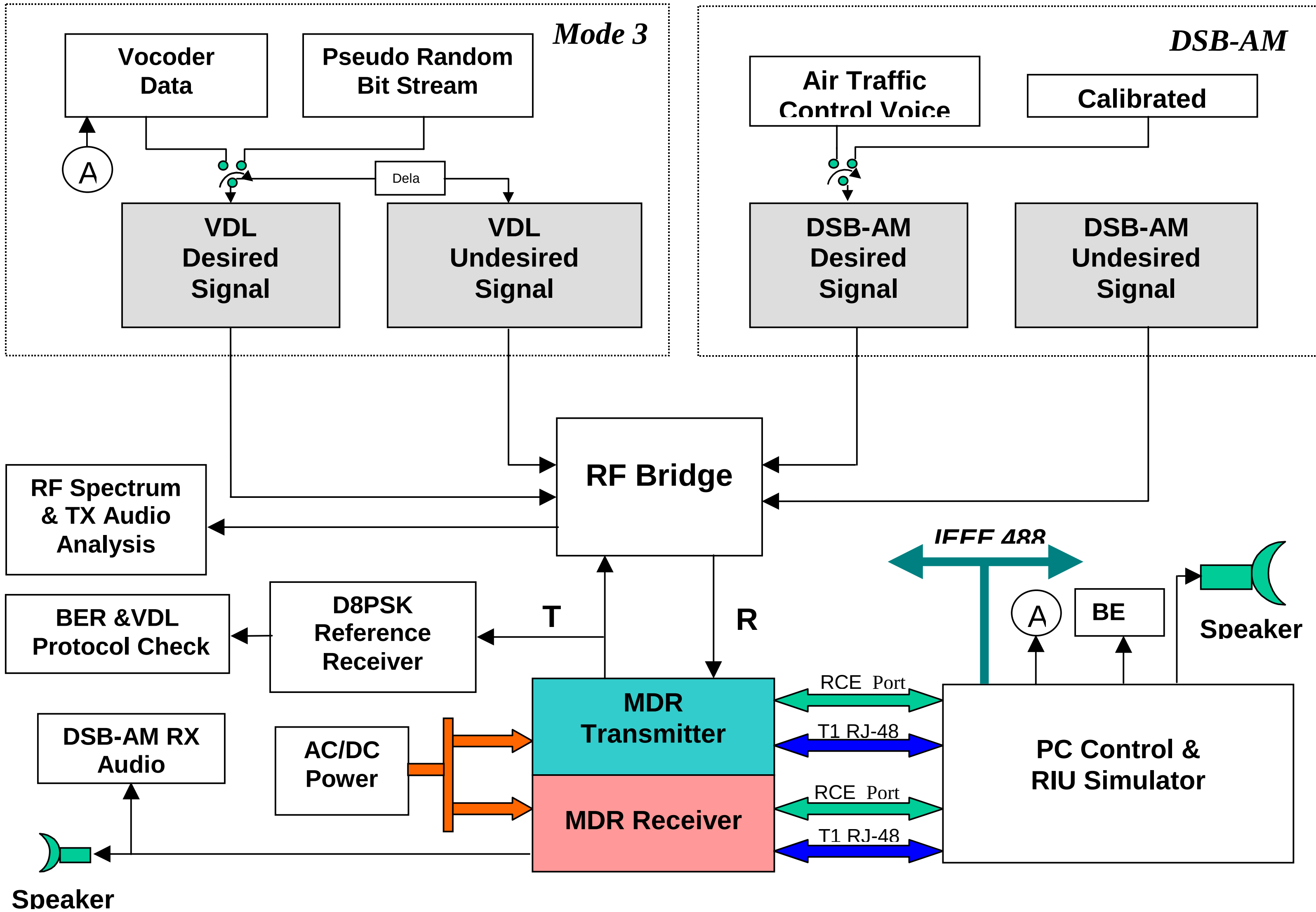

Figure 13. MDR OCT Test Bed – Functional Block Diagram

5.3.1 RIU Simulator

The RIU Simulator provides the command and control set used to drive the T1 Framer via the high speed interface.

5.3.2 T1 Framer

The T1 framer (also known as the Intelligent ISS) is driven by the RIU Simulator. Based on commands from the RIU Simulator, the T1 framer sets the time of transmission (TOT) over the T1 interface. Receipt of messages by the T1 Framer are time stamped as to its time of arrival (TOA) over the T1 Interface and passed on to the RIU Simulator.

5.4 Security

The following sections define the security controls that will be in place at the WJHTC during the MDR OCT.

5.4.1 NEXCOM Integration Laboratory

Access to the WJHTC's NEXCOM Integration laboratory, Building #300, will be highly restricted. The WJHTC Main Building laboratories have a "four level" security process. First Level access is through the guarded Main Entrance, which is only permitted by having a valid FAA Badge or a valid Visitor Badge. Visitor Badges are obtained at the Security Office located just outside the main gate. Second level access to the main building is obtained by "scanning" a valid badge through the security access reader located near the door of each major entrance. Third level access to the Air Traffic Control Laboratories (or "Red Brick Building"), where the NEXCOM Integration Laboratory is located, is even more restrictive and requires a valid badge with special access through the security reader. Finally, a locked door controls fourth level access to the NEXCOM Integration Laboratory. Only members of the MDR OCT Test Team will be permitted in the room. If Offeror presence is required, the Offeror representative will be escorted by a member of the MDR OCT Test Team, to the NEXCOM Integration Laboratory. A member of the OCT Test Team will be present at all times while an Offeror representative is in the laboratory.

5.4.2 NEXCOM Radio Laboratory

Access to the WJHTC's NEXCOM Radio Laboratory, Building #70, will also be highly restrictive. However, since this building is considerably smaller and more manageable from a security point-of-view, access will follow a two level security process. First level access will be the same as previously stated (i.e. All laboratory users MUST have a valid badge). Second level access, directly to the Radio Laboratory, will be permissible only through key access. Only members of the MDR OCT Test Team will be permitted in the Radio Laboratory during OCT. If Offeror presence is required, the Offeror representative will be escorted by a member of the MDR OCT Test Team, to the NEXCOM Radio Laboratory. A member of the MDR OCT Test Team will be present at all times while an Offeror representative is in the laboratory. During OCT evaluation, only one Offeror will be examined at one time. No Offeror will be provided the opportunity to view the "Submission for OCT" from any other Offeror.

5.4.3 Security of Offeror Equipment and Data

Each Offeror's "Submission for OCT" will be secured in a locked area in either Building 70 or Building 300. Only the Test Coordinator and the Team Leads will have "key" access to these areas and cabinets. The test results (i.e. the data) from each day's testing will be saved on a removable media and locked in a separate file cabinet for each Offeror. Test Data Sheets will be stored in the same locked cabinets. No data will be permanently logged on hard drives located in the laboratories. The Offeror will not be able to review his data nor any other Offeror's data collected during the OCT process.

5.5 OCT Test Process

The evaluation of all Offerors' equipment dictates the implementation and execution of a fair, impartial, and unbiased test process. The following subsections depict that process.

5.5.1 OCT Entry Criteria

Before OCT conduct, the Offeror will fulfill the following entry-level criteria:

a. All equipment, documentation, and interfaces required for the "Submission for OCT are onsite at the WJHTC.

b. Offeror representatives are onsite at the WJHTC.

c. Offeror installation and checkout of all MDR units has been completed.

d. All Offeror support/test equipment is onsite at the WJHTC.

e. The OCT Test Team personnel are trained by the Offeror on the UUTs.

Failure to meet the above criteria could result in a delay in the start of OCT, a failure of one or more OCT test requirements, or OCT disqualification.

Additionally, the following entry criteria will need to be met by the FAA or delays in the start of OCT may occur.

a. The WJHTC OCT Test Bed is complete and operational.

b. OCT test procedures are complete.

c. Sufficient ACT-300 test personnel are available to conduct the OCT.

5.5.2 Test Execution

A test session will be defined as the conduct of one or more test cases within a sub-test by one Test Team. Multiple teams may conduct test sessions on different sub-tests within the same time period. Within a 24 hour period, the work of one Test Team may be continued by a second Test Team. The following process applies to all test sessions for Test Team members:

a. A pre-briefing will be conducted at the commencement of each sub-test and prior to each test session.

b. A post-briefing will be conducted at the end of each sub-test and after each test session.

c. When one team is immediately continuing the work of a previous team within a sub-test, the pre- and post-briefings may be combined.

Operational status of the UUT and the OCT Test Bed will be verified daily, before the commencement of any test case/procedure.

No upgrades or design changes to the Offeror's MDR hardware or software or MDT software will be permitted.

No test procedure will be conducted when any portion of the UUT has a known failure or if any required portion of the OCT Test Bed is known to be faulty relative to the test being conducted. If a failure of the UUT is suspected, the test will be suspended and the Offeror representative will be asked to verify the operation of the UUT. If the Offeror representative determines that a failure has occurred, removal and replacement of the MDR will be permitted. After the UUT is deemed operational by the Offeror, the testing will recommence with the amount of regression testing determined necessary by the OCT Test Team (and coordinated with the Technical Evaluation Team Chairperson). If the Offeror has deemed that a failure of the UUT has not occurred, the Offeror's diagnosis will be recorded and testing will resume.

5.5.3 Exit Criteria

The exit criteria for an individual Offeror OCT will consist of full completion of all OCT test procedures on the UUTs.

5.6 OCT Reports

The following subsection describes the contents of the report, when it will be published, and to whom it will be distributed.

5.6.1 OCT Test Report Contents

The OCT Test Report will consist of two parts. The first part is the Requirements Compliance Checklist. The checklist will indicate if an Offeror has been deemed compliant for each OCT VRTM requirement (except for requirements verified by analysis). The second part will consist of the Requirements Compliance Report that will contain the following:

- OCT Test Bed Description
- OCT Test Conduct Description
- Results and Discussions
- Raw data
- Discrepancies Sheets

5.6.2 OCT Test Report Distribution

The Requirements Compliance Report will be provided within 10 days from the conclusion of the OCT, for the respective Offeror, to the MDR TET.

5.7 System/Operational Deficiency Reports

All deficiencies that are not in compliance with FAA-E-2938, FAA-E-2944, and NAS-IC-41033502 will be noted and tracked against the specific requirement and/or test case. The deficiencies will be recorded on Discrepancy Sheets and included in the corresponding OCT Test Report. Note that deficiencies discovered at any point during the OCT will be noted and tracked, even if verifying the correlating requirement was not the primary purpose of the test case.

5.8 OCT Schedule

Figure 14, MDR OCT Schedule, contains the sequence of events and the tentative duration of each OCT. The exact time allocated to each test area may vary. However, the total OCT test period per Offeror will not exceed three weeks. It is requested that the Offerors do not exceed the five days allocated for the Offeror Demonstrations. The Offerors are limited to an absolute maximum of seven days for the conduct of the Offeror Demonstrations, including any time required for resolving anomalies and UUT failures. One day is allocated to Offeror installation and checkout of the “Submission for OCT”. Likewise, one day is allocated to Offeror uninstall and repackaging of the “Submission for OCT”. As discussed in Section 5.1.3.3, one day is also allocated to Offeror Familiarization Training.

Anomalies and UUT failures could increase the total test time. The FAA reserves the right to modify this schedule, during OCT, to maximize FAA resources and preserve testing continuity.

5.9 Personnel Resource Requirements

The OCT will require numerous technically skilled personnel to conduct the evaluation. ACT-330 personnel will lead each test. Table 2, Personnel Resource Requirements, designates those personnel required to successfully complete each testing event. More than one sub-test may be conducted at any given time. A day is defined as 12 hours.

Table 2. Personnel Resource Requirements

Minimum Personnel Required for Testing	System Testing	Transmitter Testing	Receiver Testing	Interface Testing	Demon-strations	Physical Testing	Analysis Review
ACT-330 Test Engineers	2 people/ 3 days	2 people/ 5 days	2 people/ 4 days	2 people/ 2 days	2 people/ 5 days	2 people/ 1 day	
MDR Offeror Represent-atives	1 person/ 3 days	1 person/ 5 days	1 person/ 4 days	1 person/ 2 days	1 person/ 5 days	1 person/ 1 day	
NEXCOM PT Analysts							3 people/ 5 days

ID	Task Name	Duration
1	**OCT (Per Offeror)**	**15 days**
2	Offeror Install/Checkout/Inventory	1 day
3	**Bldg 300**	**6 days**
4	Offeror Familiarization	1 day
5	Offeror Demonstration	5 days
6	**Building 70 and/or Bldg 300**	**8 days**
7	**Automated Test Bed**	**8 days**
12	**Manual Tests**	**6 days**
16	FAA Inspections	1 day
17	Offeror Uninstall/Packaging	1 day
18	OCT REPORT	10 days

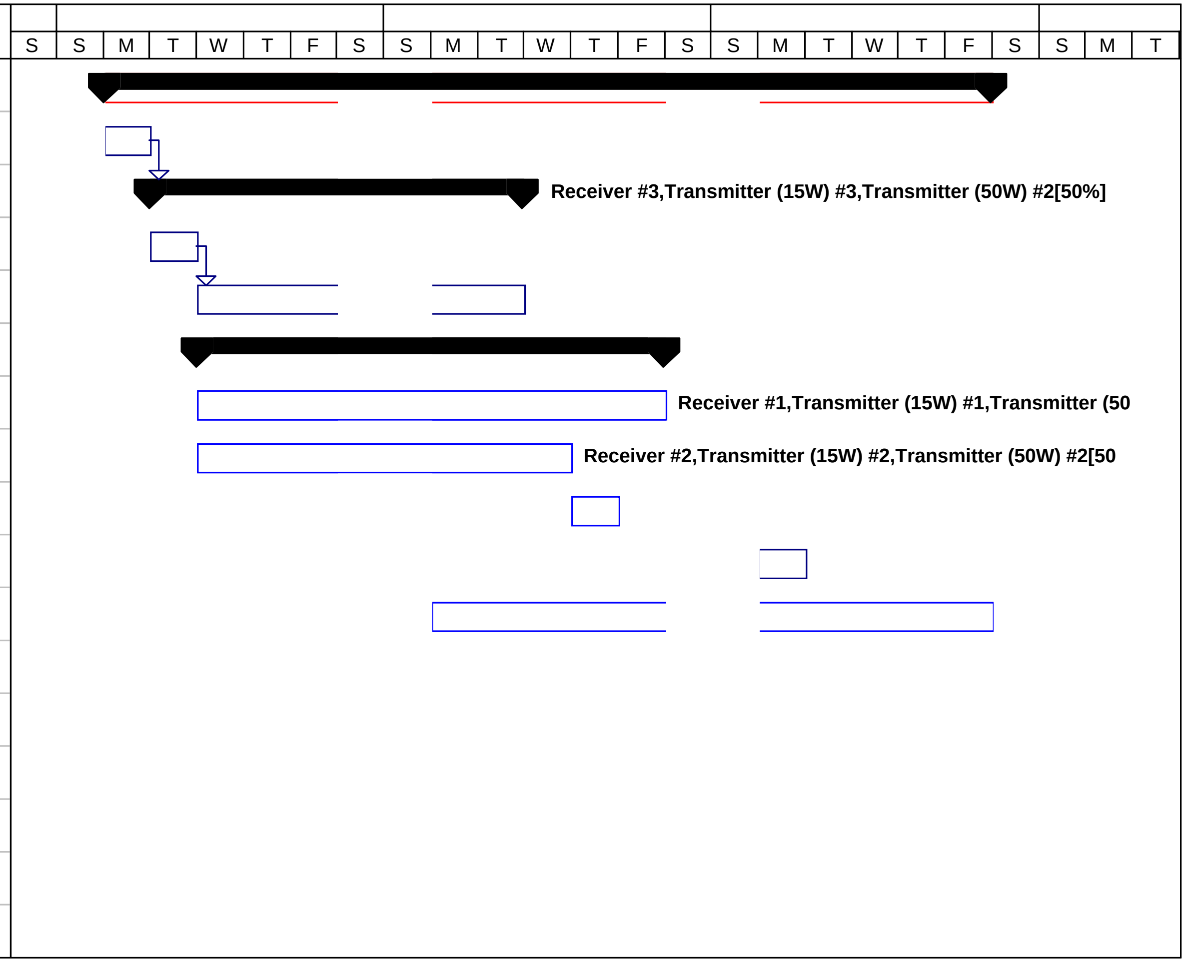

Figure 14. MDR OCT Schedule

5.9.1 ACT-330 Test Engineers

ACT-330 will provide at least two test engineers for each test procedure being conducted. They will be fully knowledgeable in the test procedures being conducted and trained in the operation of the MDR under test. Since test procedures may be conducted concurrently and over multiple shifts it is expected that as many as eight ACT-330 test engineers may be required per day.

5.9.2 MDR Offeror Representatives

MDR Offeror representatives will be required to conduct MDR training for the ACT-330 personnel prior to commencement of their MDR OCT. In addition, a minimum of one Offeror representative will be required to perform Offeror demonstrations of the monitoring features required by the test cases in Appendix B within the time period defined in Table 2. During the conduct of the monitoring demonstrations, another Offeror representative will be required to fully support the other OCT tests. As a result, a minimum of two Offeror representatives will be required to support concurrent OCT efforts at different laboratories. It is requested that the Offeror not provide more than four representatives at any one time. The Offeror may elect to reduce the number of representatives onsite after the completion of the Offeror Demonstrations.

5.9.3 NEXCOM PT Engineers/Analysts

Members of the NEXCOM PT, whom are selected members of the TET, will assume primary responsibility for review and evaluation of the Analysis documentation provided by the Offerors. The TET will also be the recipients of the OCT Requirement Compliance Checklists and Requirement Compliance Reports provided by ACT-330 which will be used as part of the Technical Evaluation Process.

5.10 Planning Considerations and Limitations

The following limitations will be exercised during the OCT:

1. The Offeror Demonstrations will not include evaluation of the 50 watt transmitter except for test case DMPO. All other Offeror demonstrations that use an OCT transmitter will be conducted only on the 15 watt transmitter (or a 2 watt to 50 watt single enclosure transmitter). If a single enclosure transmitter is provided, the demonstrations should be conducted as if the unit was a 15 watt transmitter (except for test case DMPO).

2. The Offeror Demonstrations will not include use of the RIU interface. All testing of the RIU interface will be conducted as part of the Interface Tests.

3. Individual Test Case limitations are noted in the associated test case.

6.0 Acronyms and Glossary

AC	Alternating Current
A/G	Air/Ground
AGC	Automatic Gain Control
AM	Amplitude Modulation
AMS	Acquisition Management System
ATC	Air Traffic Control
ATE	Automated Test Equipment
ATN	Aeronautical Telecommunications Network
ATR	Antenna Transfer Relay
BER	Bit Error Rate
BIT	Built in Test
bps	bits per seconds
CM	Configuration Management
CRP	Compliance Remediation Plan
CW	Continuous Wave
D8PSK	Differential 8 Phase Shift Keying
dB	Decibel
dBc	Decibels referenced to carrier
dBm	Decibels referenced to 1 milliwatt
DC	Direct Current
DF	R-S Coded Data
DSB-AM	Double Side Band – Amplitude Modulation
EMC	Electromagnetic Compatibility
ESD	Electro-static Discharge
EVM	Error Vector Magnitude
GFE	Government Furnished Equipment
GNSS	Global navigation Satellite System
GPIB	General Purpose Interface Bus
HDLC	High-Level Data Link Control
HP	Hewlett Packard
Hz	Hertz
ISS	Interface Subset Simulator
kHz	Kilo Hertz
LBAC	Logical Burst Access Channel
LEN	Length (of Segment)
LL	Lower Level
LRU	Line Replaceable Unit
LSB	Least Significant Byte
mA	Milliampere
MAC	Media Access Control
MASPS	Minimum Aviation System Performance Standards
MDR	Multimode Digital Radio
MDT	Maintenance Data Terminal
MDTS	Maintenance Data Terminal Software

MHz	Megahertz
ms	millisecond(s)
MSB	Most Significant Byte
MSG	Message
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
NAS	National Airspace System
NDI	Non-Developmental Item
NEXCOM	Next Generation Air/Ground Communication
NT	Not Tested
NTIA	National Telecommunications and Information Administration
OCD	Operational Capabilities Demonstration
OCT	Operational Capabilities Test
PC	Personnel Computer
PCM	Pulse Coded Modulation
POC	Point of Contact
ppm	Parts Per Million
PT	Product Team
PTT	Push-to-Talk
RAM	Random Access Memory
RCE	Radio Control Equipment
RCR	Requirements Compliance Report
RF	Radio Frequency
RIU	Radio Interface Unit
RMM	Remote Maintenance Monitor
rms	Root Mean Square
RR	Request/Reply
RTCA	RTCA, Inc. (formerly Radio Technical Commission for Aeronautics)
RX	Receiver
SINAD	Ratio of Signal plus Noise plus Distortion to Noise plus Distortion
STYPE	Synchronization Header Type
T/R	Transmitter/Receiver
T/T	Transmitter/Transmitter
T&E	Test and Evaluation
TET	Technical Evaluation Team
TDMA	Time Division Multiple Access
TOA	Time of Arrival
TOT	Time of Transmission
TSC	Total Segment Count
TX	Transmitter
UI	Un-numbered Information
UUT	Unit Under Test
VDL	VHF Digital Link
V	Volt(s)
V/D	Voice/Data
VAC	Volts Alternating Current

VDC	Volts Direct Current
VF	Voice Frame
VHF	Very High Frequency
VRTM	Verification Requirements Traceability Matrix
VSWR	Voltage Standing Wave Ratio
WJHTC	William J. Hughes Technical Center

APPENDIX A - OCT VERIFICATION REQUIREMENTS TRACEABILITY MATRIX

OCT VRTM: This appendix includes all the OCT requirements. The OCT VRTM will indicate the specific tests (at the level described in the test plan) where each requirement is being addressed.

MDR OCT VRTM

Document: FAA-E-2938

Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
1	3.2 a)	MDR Requirements	The MDR shall be implemented as a separate receiver and separate transmitter.	I	PS&W	MDR Ver 3.0
2	3.2.1.1 a)	Modes of Operation	The MDR receivers and transmitters shall operate in the ICAO DSB-AM Mode using 25kHz channel separation.	D	DSTU	
3	3.2.1.1 b)	Modes of Operation	The MDR receivers and transmitters shall operate in the ICAO VDL Mode 3 using 25 kHz channel separation.	D	DSTU	
4	3.2.1.1 c)	Modes of Operation	When in the 8 1/3 kHz DSB-AM (voice) mode, the MDR shall operate in compliance with ETSI specification EN-300-676, (excluding Sections 4.4 and 5) except where a requirement in this document (MDR SSS FAA-E-2938) conflicts with a requirement in ETSI specification EN-300-676, the more stringent requirement applies.	A	A833	
5	3.2.1.1.1 a)	Tuning Range and Channel Increments	The MDR receivers and transmitters shall tune to 25 kHz channels from 112.000 MHz to 136.975 MHz.	D	DSTU	
6	3.2.1.1.1 b)	Tuning Range and Channel Increments	The MDR receivers and transmitters shall have a user selectable lowest tunable frequency between 112.000 MHz and 118.000 MHz that is selectable in 25 kHz steps.	D	DSTU	
7	3.2.1.1.1 c)	Tuning Range and Channel Increments	Upon initialization (cold start as defined in Section 6.2.13), the start frequency shall default to 118.000 MHz and all control and monitor parameters assume their default values.	D	DSTU	
8	3.2.1.1.1 d)	Tuning Range and Channel Increments	The MDR equipment shall also tune in 8 1/3 kHz.	D	DSTU	
9	3.2.1.2 a)	VDL Mode 3 Protocol Services	The MDR receiver and transmitter shall comply with RTCA DO-224a (MASPS).	A/T	AMAC/TVRF	TVRF - Ramp-up/ramp-down timing. Note: AMAC must address Ramp-up/Ramp-down
10	3.2.1.2.1 a)	VDL Mode 3 Physical Layer	VDL Mode 3 shall use the Differential 8 Phase Shift Keying (D8PSK) modulation scheme defined in the RTCA VDL Mode 3 MASPS.	T	TVMD	
11	3.2.1.2.1 b)	VDL Mode 3 Physical Layer	The VDL Mode 3 symbol rate shall be 10,500 symbols/s with a tolerance of +/- 2 parts per million (ppm), resulting in a nominal data rate of 31,500 bits per second (bps).	T	TVMD	
12	3.2.1.2.2 a)	VDL Mode 3 Link Layer	The VDL Mode 3 Link Layer shall be in accordance with DO-224a (MASPS).	A	AMAC	
13	3.2.1.2.2.1 a)	VDL Mode 3 MAC Sublayer	The MAC sublayer of the MDR receiver and transmitter shall be as defined in the RTCA DO-224a (MASPS).	A	AMAC	
14	3.2.1.2.2.2 a)	External Time Reference	The MDR shall use the timing reference provided by the RIU as the basis for the frame timing for VDL Mode 3.	T	ISTC	

MDR OCT VRTM

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
15	3.2.1.2.2.3 a)	LBACs for the Transmitter	The MDR transmitter shall transmit VDL Mode 3 bursts received from the RIU based on the Time of Transmission (TOT) field of the Voice, Data, and Management burst (v-burst, D-burst, M-burst) messages as defined in NAS-IC-41033502.	T	ISTC	
16	3.2.1.2.2.3 b)	LBACs for the Transmitter	The MDR shall use the TOT field as the time offset from the start of the VDL Mode 3 6-second epoch (measured in 1/16th of a D8PSK symbol period, the symbol period being 95.24 usec) to initiate the transmission of the burst.	T	ISTC	
17	3.2.1.3.1	Physical Layer	The modulation method shall be DSB-AM in accordance with the CFR 47, Part 2 and Part 87 and NTIA, Regulations and Procedures for Federal Radio Frequency Management (Chapter 6, paragraph 6.3).	A	AMMD	
18	3.2.1.4 a)	Software and Processor Requirements	The equipment shall be reconfigurable to allow the MDR receiver and transmitter to operate in the known ICAO standardized communication waveforms (i.e., 25 kHz DSB-AM, 8.33 kHz DSB-AM, and VDL Mode 3).	D	DSTU	
19	3.2.1.4 b)	Software and Processor Requirements	Protocols and user access/synchronization schemes in the equipment shall be programmable.	A	ASPC	
20	3.2.1.4 c)	Software and Processor Requirements	The MDR receiver and transmitter equipment, as separate entities, shall use no more than 50 percent of their non-volatile memory (as defined in Section 6.2.16) or storage, under worst-case conditions.	A	ASPC	
21	3.2.1.4 d)	Software and Processor Requirements	The MDR receiver and transmitter, as separate entities, shall use no more than 50 percent of their Random Access Memory (RAM), under worst-case conditions (e.g., when the MDR has both the software-in-use and a second software version loaded).	A	ASPC	
22	3.2.1.4 e)	Software and Processor Requirements	The processor utilization of the MDR receiver and transmitter, as separate entities, shall peak at 50 percent or less.	A	ASPC	
23	3.2.1.4 f)	Software and Processor Requirements	The equipment shall be able to accurately process dates in data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, including leap year calculations.	A	ASPC	
24	3.2.1.4 g)	Software and Processor Requirements	If the MDR does not successfully restart after receipt and execution of the Switch Software Version control parameter command, the MDR receiver and transmitter shall revert to the previous version of software and restart.	D	DMCP	
26	3.2.2.1. 1.2 e)	Receiver Digital and Audio Interfaces - DSB-AM	The main audio level shall be controllable both locally from the MDT and remotely via the RIU.	D	DMCP	RIU not verified in this test case
27	3.2.2.1. 1.1 a)	Receiver Digital and Audio Interfaces - VDL Mode 3	The digital interface shall carry digitized voice with time-multiplexed user data, control signals, and timing signals, and RMMC information between the receiver and the RIU.	LL	None	Must meet all NAS-IC-41033502 applicable to the Receiver

MDR OCT VRTM

Document: FAA-E-2938

Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
29	3.2.2.1. 1.2 a)	Receiver Digital and Audio Interfaces - DSB-AM	The MDR receiver shall provide a main audio output to the RCE connector on the rear of the receiver (See Section 3.3.1.3).	I	PCON	
30	3.2.2.1. 1.2 d)	Receiver Digital and Audio Interfaces - DSB-AM	The main and local audio outputs shall have a balanced 600 ohms (+/-10 percent) output impedance.	T	RAIF	
31	3.2.2.1. 1.2 b)	Receiver Digital and Audio Interfaces - DSB-AM	There shall be a local audio signal output terminated in a headset/headphone jack located on the front panel of the receiver.	I	PCON	
32	3.2.2.1. 1.2 f)	Receiver Digital and Audio Interfaces - DSB-AM	The output level of the local headset/headphone shall be controllable from the front panel independent of the main audio level control.	T	RAIF	
33	3.2.2.1. 2.1 a)	Uncorrected BER - VDL Mode 3	The uncorrected BER performance of equal to or better than 10E-3 shall be achieved under the conditions specified in Sections 3.2.2.1.3, 3.2.2.1.7, 3.2.2.1.17 through 3.2.2.1.22 and 3.2.2.1.25.	T	RVCC/RVCO/RVCP/ RVCR/RVDR/RVIM /RVOV/RVSN	
36	3.2.2.1. 3.1 a)	Receiver Sensitivity - VDL Mode 3	In the absence of added external noise, the specified uncorrected BER (See Section 3.2.2.1.2.1) shall be achieved with a -100 dBm VDL Mode 3 signal at the MDR receiver antenna RF input.	T	RVSN	
37	3.2.2.1. 3.2 a)	Receiver Sensitivity - DSB-AM	The MDR receiver shall produce a SINAD (ratio of (Signal plus Noise plus Distortion) to (Noise plus Distortion)) of 10 dB or greater at the main and local audio outputs when an RF signal of no more than -102 dBm (modulated at 30 percent with a 1004 Hz tone) is present at the MDR RF input.	T	RASN	Main Audio Only
38	3.2.2.1. 5 a)	Receiver Selectivity - VDL Mode3 and DSB-AM	The selectivity of the MDR receiver shall conform to Table 3-2 with respect to the tuned channel center frequency across the entire frequency band:	D	DRSL	See Table 3-2
39	3.2.2.1. 6 a)	Receiver Image Rejection - VDL Mode 3 and DSB-AM	There shall be no image frequencies within the 112.000 MHz to 136.975 MHz frequency band.	A	ARIR	
40	3.2.2.1. 6 b)	Receiver Image Rejection - VDL Mode 3 and DSB-AM	The sensitivity requirements of Section 3.2.2.1.3 shall not be degraded more than 3 dB in the presence of an unmodulated carrier for all spurious response frequencies (including the receiver image frequency) applied to the MDR RF input at a level 80 dB above the desired signal.	A	ARIR	
41	3.2.2.1. 7.1 a)	Receiver Intermodulation - VDL Mode 3 and DSB-AM	The sensitivity requirements defined in 3.2.2.1.3 shall not be degraded by more that 3 dB in the presence of two – 5 dBm modulated interfering signals, both FM modulated with a 400 Hz tone 75 kHz deviation, with the interfering frequencies chosen in the 87.5 MHz to 107.9 MHz range, such that one of the 3rd order products is located on the chosen receive frequency.	T	RAIM/RVIM	RAIM - DSB-AM/ RVIM - VDL Mode 3
42	3.2.2.1. 7.1 c)	Receiver Intermodulation - VDL Mode 3 and DSB-AM	The sensitivity requirements defined in Section 3.2.2.1.3 shall not be degraded by more than 3 dB in the presence of two –30 dBm interfering signals 90 percent AM modulated with a 400 Hz tone, in the 112.000 MHz to 136.975 MHz band, with the frequencies of the interfering signals offset from the desired channel by +2.0 MHz and +4.0 MHz, or –2.0 MHz and –4.0 MHz, respectively.	T	RAIM/RVIM	RAIM - DSB-AM/ RVIM - VDL Mode 3

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
43	3.2.2.1. 7.2.2 a)	Cross Modulation - DSB-AM	An on-channel signal (modulated 30 percent with a 1004 Hz tone) adjusted to produce a 10.0 dB SINAD ratio, shall produce not less than 8.0 dB SINAD ratio in the presence of an off-channel signal modulated 30 percent with a 400 Hz tone as defined below: 1. An off-channel signal separated from the desired on-channel signal by +/- 0.5 MHz, at a level 70.0 dB above the desired signal. 2. An off-channel signal separated from the desired on-channel signal by +/- 1.0 MHz, at a level 75.0 dB above the desired signal. 3. An off-channel signal separated from the desired on-channel signal by +/- 1.5 MHz, at a level 80.0 dB above the desired signal.	T	RACM	
47	3.2.2.1. 8 a)	Receiver Frequency Tolerance - VDL Mode 3 and DSB-AM	The frequency tolerance of the receiver reference frequency shall be +/- 0.0001 percent (+/- 1 ppm) of it's reference value for a period of one year following alignment over the full frequency range specified in Section 3.2.1.1.1, and the temperature range specified in Section 3.4.3.1.	A	ALOF	
48	3.2.2.1. 9 a)	Receiver Audio Output Control	With an RF input consisting of a -87 dBm carrier AM modulated 30 percent with a 1004 Hz tone, the audio output level of the MDR receiver shall be adjustable between -25 dBm and +20 dBm in 0.5 dB steps.	D/T	DMCP/RAAC	DMCP by Test Method "D" (0.5 step size)/RAAC by Test Method "T"
49	3.2.2.1.10.2 a)	Receiver Audio Level Regulation - DSB-AM	With an RF input signal of -87 dBm (modulated 30 percent with a 1004 Hz tone) and the receiver adjusted for an audio output level of +20 dBm, the audio signal shall not vary more than +/- 1.0 dB as the modulation is increased to 100 percent.	T	RAAC	
50	3.2.2.1.10.2 b)	Receiver Audio Level Regulation - DSB-AM	With an initial audio output of +20 dBm into a 600 ohms load resistance at the main output, the audio output shall not drop more than 4.0 dB with a reduction of the load resistance to 120 ohms.	T	RAAC	
51	3.2.2.1.11.2 a)	Receiver Audio Automatic Level Stabilization - DSB-AM	With a -50 dBm RF input signal modulated 30 percent with a 1004 Hz tone as a reference, the audio output of the receiver shall not vary by more than +/- 3 dB from the reference level when the reference RF input signal is varied in level between -95 dBm and -7 dBm.	T	RAFR	
52	3.2.2.1.12.2 a)	Receiver Audio Mute and Attenuation - DSB-AM	The MDR receiver shall have a control input and analog input for muting the receiver main audio output.	D	DMCP	
53	3.2.2.1.12.2 b)	Receiver Audio Mute and Attenuation - DSB-AM	Muting shall be activated or deactivated via the MDT and/or RIU, or from an analog source.	D	DMCP	RIU not verified in this test case
54	3.2.2.1.12.2 c)	Receiver Audio Mute and Attenuation - DSB-AM	The muting function attenuation shall be selectable from 0 dB (no mute), 15 dB, 20 dB, or no audio (infinite attenuation).	D	DMCP	
55	3.2.2.1.12.2 d)	Receiver Audio Mute and Attenuation - DSB-AM	The tolerances for the selectable attenuation shall be +/-3 dB.	D	DMCP	
56	3.2.2.1.12.2 e)	Receiver Audio Mute and Attenuation - DSB-AM	The default shall be no audio.	D	DMCP	

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59	3.2.2.1.14.2 a)	Receiver Audio Distortion - DSB-AM	The total distortion in the main and local audio output shall not be more than 2.0 percent for 30 percent modulation or more than 5.0 percent for 90 percent modulation with any RF input level between -67 dBm and -27 dBm, for input tones varying between 300 Hz and 3.0 kHz.	T	RAAD	Main Audio Only
60	3.2.2.1.15.2 a)	Receiver Audio Frequency Response - DSB-AM	With an RF input signal between –102 dBm and –7 dBm modulated 90 percent, the maximum variation in the main and local audio output shall not be more than +/- 2.0 dB from the level achieved with a 1004 Hz input reference, when the input is varied between 300 Hz and 3.0 kHz.	T	RAFR	Main Audio Only
61	3.2.2.1.15.2 b)	Receiver Audio Frequency Response - DSB-AM	The main and local audio output shall decrease as the frequency increases between 3 kHz and 10 kHz.	T	RAFR	Main Audio Only
62	3.2.2.1.15.2 c)	Receiver Audio Frequency Response - DSB-AM	The main and local audio output shall be down at least 20.0 dB at 10.0 kHz and above.	T	RAFR	Main Audio Only
63	3.2.2.1.15.2 d)	Receiver Audio Frequency Response - DSB-AM	Below 300 Hz, the main and local audio output shall decrease as the frequency decreases and be down at least 10.0 dB at 100 Hz.	T	RAFR	Main Audio Only
64	3.2.2.1.16.1.2 a)	Receiver Squelch - DSB-AM	The MDR receiver shall have a squelch system consisting of both an RF level threshold and an audio signal-to-noise threshold.	A	ARSQ	
66	3.2.2.1.16.1.2 c)	Receiver Squelch - DSB-AM	Main and local audio level spikes due to squelch shall be 20.0 dB below the audio alignment level under any operating conditions.	T	RASQ	Main Audio Only
67	3.2.2.1.16.2.2 a)	Receiver Squelch Adjustment, Sensitivity, and Hysteresis - DSB-AM	The squelch adjustment shall provide the means to control squelch sensitivity locally using the MDT and/or remotely via RIU.	D	DMCP	RIU not verified in this test case
68	3.2.2.1.16.2.2 b)	Receiver Squelch Adjustment, Sensitivity, and Hysteresis - DSB-AM	The MDR receiver main and local audio shall be enabled when both an audio Signal-to-Noise ratio and RF power level exceed threshold values defined in c) and d) below.	A	ARSQ	
69	3.2.2.1.16.2.2 c)	Receiver Squelch Adjustment, Sensitivity, and Hysteresis - DSB-AM	The audio Signal-to-Noise threshold value shall be adjustable (+/- 2 dB) anywhere in the range of +5 dB (minimum) to +15 dB.	A	ARSQ	
70	3.2.2.1.16.2.2 d)	Receiver Squelch Adjustment, Sensitivity, and Hysteresis - DSB-AM	The RF CW power level threshold value shall be adjustable (+/- 2 dB) from –102 dBm to –50 dBm.	A	ARSQ	
72	3.2.2.1.16.2.2 e)	Receiver Squelch Adjustment, Sensitivity, and Hysteresis - DSB-AM	Squelch closing hysteresis on the RF power level shall be not less than 2 dB and not greater than 5 dB with respect to the RF CW threshold level to which the MDR receiver is adjusted.	A	ARSQ	
73	3.2.2.1.16.3.2 a)	Receiver Squelch Attack and Release Times - DSB-AM	With any RF input signal level between – 97 dBm and – 7 dBm, AM modulated 30 percent with a 1004 Hz tone, the squelch attack time shall not exceed 10 ms.	T	RASQ	

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74	3.2.2.1.16.3.2 b)	Receiver Squelch Attack and Release Times - DSB-AM	The release time shall not exceed 35 ms.	T	RASQ	
75	3.2.2.1.17.1 a)	Collocation - VDL Mode 3	While in a fixed tuned configuration, the VDL Mode 3 sensitivity requirements defined in Section 3.2.2.1.3 shall not be degraded by more than 8 dB (-92 dBm) in the presence of an off channel transmitter, keyed, with a 15 watt carrier, DSB-AM modulated 90 percent with a 400 Hz tone or a 15 watt VDL Mode 3 transmitter with four slots active and in time synchronization with the desired signal, when the frequency separation and transmit-receive path isolation in Case A or Case B below is provided.	T	RVCO	
77	3.2.2.1.17.2 a)	Collocation - DSB-AM	While in a fixed tuned configuration, the DSB-AM sensitivity requirements defined in Section 3.2.2.1.3 shall not be degraded by more than 10 dB (-92 dBm) in the presence of an off channel transmitter, keyed, with a 15 watt carrier, DSB-AM modulated 90 percent with a 400 Hz tone or in the presence of a 15 watt VDL Mode 3 transmitter with four slots active, when the frequency separation and transmit-receive path isolation in Case A or Case B below is provided.	T	RACO	
79	3.2.2.1.18.1 a)	Receiver Adjacent Channel Rejection - VDL Mode 3	The uncorrected BER requirement as defined in Section 3.2.2.1.2 shall be achieved in the presence of a -55 dBm adjacent channel (centered on +/-25 kHz) interfering VDL Mode 3 signal in addition to a -97 dBm desired signal applied to the MDR RF input.	T	RVCR	
80	3.2.2.1.18.2 a)	Receiver Adjacent Channel Rejection - DSB-AM	The AM sensitivity requirement as defined in Section 3.2.2.1.3 shall not be degraded by more than 3 dB in the presence of a -65 dBm adjacent channel (centered on +/- 25 kHz) interfering AM signal, modulated 90 percent with a 400 Hz tone.	T	RACR	
81	3.2.2.1.19 a)	Receiver Rejection of Signals Outside the VHF Band - VDL Mode 3 and DSB-AM	The BER requirement for a VDL Mode 3 receiver while in a fixed tuned mode shall be achieved when any of the below specified unwanted signals is applied in addition to the wanted signal set at an RF signal level of -98 dBm at the MDR RF input.	T	RVOV	
82	3.2.2.1.19 b)	Receiver Rejection of Signals Outside the VHF Band - VDL Mode 3 and DSB-AM	The DSB-AM sensitivity (see Section 3.2.2.1.3.2) while in a fixed tuned mode shall not be degraded to a value worse than 10 dB SINAD when any of the below specified unwanted signals is applied in addition to the wanted signal set at an RF signal level of -100 dBm at the MDR RF input.	T	RAOV	
84	3.2.2.1.21.1 a)	Receiver Desired Signal Dynamic Range - VDL Mode 3	The MDR receiver shall achieve the uncorrected BER requirement (see Section 3.2.2.1.2) when operating with desired signal levels from –100 dBm up to -7 dBm at the MDR RF input.	T	RVDR	
85	3.2.2.1.21.2 a)	Receiver Desired Signal Dynamic Range - DSB-AM	The MDR receiver shall achieve a SINAD of 10 dB or greater when operating with desired signals modulated 90 percent with a 1004 Hz tone at an RF level from –102 dBm up to – 7 dBm at the MDR RF input.	T	RADR	

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86	3.2.2.1.21.2 b)	Receiver Desired Signal Dynamic Range - DSB-AM	The MDR receiver shall not be blocked with desired signals modulated 90 percent with a 1004 Hz tone at the input levels up to +13 dBm.	T	RADR	
87	3.2.2.1.22.1 a)	Receiver Symbol Rate Capture Range - VDL Mode 3	The sensitivity requirement of Section 3.2.2.1.3 shall be achieved when a desired signal is applied to the MDR RF input, with a symbol rate offset of +/- seven (7) ppm (5 ppm airborne tolerance plus 2 ppm Doppler shift) from the nominal symbol rate of 10,500 symbols per second (see Section 3.2.1.2.1).	A	ARCP	
88	3.2.2.1.23.1 a)	Receiver Frequency Capture Range - VDL Mode 3	The MDR receiver shall support synchronization acquisition and meet the sensitivity requirement of Section 3.2.2.1.3 with a maximum carrier frequency offset from of +/- 885 Hz plus receiver frequency stability from nominal for air/ground communications.	T	RVCP	
89	3.2.2.1.24.1 a)	Receiver Doppler Rate - VDL Mode 3	The sensitivity requirement of Section 3.2.2.1.3 shall be met with a carrier frequency change rate of 18 Hz/s within the entire range of Doppler shift +/- 200 Hz, and meeting the requirement of Section 3.2.2.1.23.1.	A	ARDP	
90	3.2.2.1.25.1 a)	Receiver Co-Channel Interference - VDL Mode 3	The uncorrected BER requirement under a co-channel interference condition shall be achieved when a ratio of wanted to unwanted signal of at most 20 dB is applied at the MDR RF input.	T	RVCC	
92	3.2.2.1.26.2 a)	Receiver AGC Stabilization - DSB-AM	The MDR receiver shall produce a 10 dB SINAD with the minimum signal specified (see Section 3.2.2.1.17.2, Case B) not later than 20 milliseconds after insertion of a +14 dBm CW signal +/- 2 MHz away from the frequency to which the MDR receiver is tuned.	T	RAAS	
93	3.2.2.1.26.2 b)	Receiver AGC Stabilization - DSB-AM	The MDR receiver shall produce a 10 dB SINAD with the minimum signal specified (see Section 3.2.2.1.3) not later than 150 milliseconds after removal of a +14 dBm CW signal +/-2 MHz away from the frequency to which the MDR receiver is tuned.	T	RAAS	
94	3.2.2.1.27.2 a)	Receiver Internal Noise Level - DSB-AM	For a –85 dBm RF input signal AM modulated at 30 percent with a 1004 Hz tone, the SINAD at the MDR receiver audio output shall be at least 25 dB.	T	RASN	
95	3.2.2.2 a)	MDR Transmitter Requirements	There shall be two configurations of transmitters: 1) one configuration with an output power level adjustable from 2 watts to 15 watts, and 2) a configuration with an output power level adjustable from 10 watts to 50 watts.	D	DMPO	
96	3.2.2.2. 1 a)	Transmitter Digital and Audio Interfaces	There shall be three audio inputs to the transmitter: 1) analog voice from the control site, 2) analog local voice from the jack on the front of the transmitter, and 3) PCM voice from the RIU.	T	TALK	PCM voice portion of this requirement not verified during OCT
97	3.2.2.2. 1 b)	Transmitter Digital and Audio Interfaces	The transmission of the voice input shall be PTT controlled except for PCM voice, where the presence and absence of the voice packets implies a PTT.	T	TALK	
98	3.2.2.2. 1 c)	Transmitter Digital and Audio Interfaces	Only one of the three audio inputs shall be active at one time.	T	TALK	PCM voice portion of this requirement not verified during OCT

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101	3.2.2.2. 1.1 b)	Transmitter Digital and Audio Interfaces - VDL Mode 3	Voice shall have priority over monitoring data.	A	AVPM	
102	3.2.2.2. 1.2 a)	Transmitter Digital and Audio Interfaces - DSB-AM	The MDR transmitter shall have a main audio input at the rear of the transmitter.	I	PCON	
103	3.2.2.2. 1.2 b)	Transmitter Digital and Audio Interfaces - DSB-AM	The main audio input shall have a balanced 600 ohm (+/- 10 percent) impedance.	T	TAML	
104	3.2.2.2. 1.2 c)	Transmitter Digital and Audio Interfaces - DSB-AM	There shall be provisions for a local audio input from a push-to-talk microphone.	I	PCON	
105	3.2.2.2. 1.2 d)	Transmitter Digital and Audio Interfaces - DSB-AM	The microphone shall plug directly into the front panel of the transmitter.	I	PCON	
106	3.2.2.2. 2.2 a)	Transmitter Time-Out - DSB-AM	The transmitter shall contain a time-out function for protection against, and the elimination of, extended periods of inadvertent continuous keying.	D	DMTT	
107	3.2.2.2. 2.2 b)	Transmitter Time-Out - DSB-AM	This adjustable transmitter time-out shall range from 5 seconds up to 5 minutes in 5-second steps (limiting the maximum continuous keying of the transmitter to this time period).	D	DMTT	
108	3.2.2.2. 2.2 c)	Transmitter Time-Out - DSB-AM	The time-out feature shall have provisions for disabling (see Section 3.2.3.2 and Table 3-3) to allow the transmitter unlimited continuous transmit operation.	D	DMTT	
109	3.2.2.2. 3.1 a)	Transmitter Distortion - VDL Mode 3	The error vector magnitude (EVM) of the D8PSK transmitted I/Q constellation shall be not greater than 5 percent.	T	TVMD	
111	3.2.2.2. 3.2 b)	Transmitter Distortion - DSB-AM	Over the same frequency range when the audio input level is set to achieve maximum limiting (see Section 3.2.2.2.4.2), the modulation distortion shall not exceed 10 percent rms.	T	TAHT	
112	3.2.2.2. 3.2 a)	Transmitter Distortion - DSB-AM	With an audio tone set to any frequency between 300 Hz and 3.0 kHz at any level between -25.0 dBm to +20.0 dBm, and the modulator adjusted to achieve 90 percent modulation, the resulting modulation distortion shall not exceed 5 percent rms.	T	TAHT	
113	3.2.2.2. 4.2 a)	Transmitter AM Modulation Level - DSB-AM	The MDR transmitter shall prevent overmodulation of the carrier under all conditions and to retain a modulation level: 1) at +/- 10 percent of the setting of the Control Parameter ID#13, transmitter Modulation Percent (AM) and 2) that does not exceed 100 percent for a 1004 Hz tone with an audio level that varies over the full specified input range when either the analog input (regardless of audio input level setting) or the PCM voice is used.	T	TAML	PCM voice portion of this requirement not verified during OCT
114	3.2.2.2. 5 a)	Transmitter RF Output Power	The MDR transmitter shall operate in any mode at any power level for load Voltage Standing Wave Ratio (VSWR) up to and including 3.0:1.	T	TARF/TVRF	TARF - DSB-AM/TVRF - VDL Mode 3

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115	3.2.2.2. 5 b)	Transmitter RF Output Power	The MDR transmitter shall not suffer any damage nor suffer subsequent performance degradation, and meets all its requirements after transmitting in any mode at any power level into a complex impedance of any magnitude and phase, including open and short circuit terminations.	T	TARF	
116	3.2.2.2. 5 c)	Transmitter RF Output Power	The MDR transmitter shall operate at a VSWR of 2.0:1 or less with no damage, with no part exceeding dissipation limits and with no performance degradation.	T	TARF/TVRF	TARF - DSB-AM/TVRF - VDL Mode 3
117	3.2.2.2. 5.1 a) 1)	Transmitter RF Output Power - VDL Mode 3, 15 Watt Power Output	The MDR transmitter shall deliver the minimum RF output (averaged over a V/D-burst or M-burst) as specified in the header of the burst into a nominal 50-ohm load impedance.	T	TVRF	
118	3.2.2.2. 5.1 a) 2)	Transmitter RF Output Power - VDL Mode 3, 15 Watt Power Output	The MDR transmitter RF output shall be adjustable in 0.5 dB steps over the range from 2 watts to 15 watts.	T	TVRF	0.5dB step size will not be verified during OCT
119	3.2.2.2. 5.1 a) 3)	Transmitter RF Output Power - VDL Mode 3, 15 Watt Power Output	The MDR transmitter shall deliver not less than 50 percent of the set RF signal power into any impedance having a maximum VSWR of 3:1 at any phase angle.	T	TVRF	
120	3.2.2.2. 5.1 b) 1)	Transmitter RF Output Power - VDL Mode 3, 50 Watts Power Output	The MDR transmitter shall deliver the RF power output (averaged over a V/D-burst or M-burst) as specified in the header of the burst into a nominal 50-ohm load impedance.	T	TVRF	
121	3.2.2.2. 5.1 b) 2)	Transmitter RF Output Power - VDL Mode 3, 50 Watts Power Output	The MDR transmitter RF output shall be adjustable in 0.5 dB steps over the range from 10 watts to 50 watts.	T	TVRF	0.5dB step size will not be verified during OCT
122	3.2.2.2. 5.1 b) 3)	Transmitter RF Output Power - VDL Mode 3, 50 Watts Power Output	The MDR transmitter shall deliver not less than 50 percent of the set RF signal power into any impedance having a maximum VSWR of 3:1 at any phase angle.	T	TVRF	
124	3.2.2.2. 5.2 a) 1)	Transmitter RF Output Power - DSB-AM, 15 Watt Power Output	The MDR transmitter shall deliver the RF output specified in Control Parameter #12, Power Output, into a nominal 50 ohm load impedance when transmitting a CW signal.	T	TARF	
125	3.2.2.2. 5.2 a) 2)	Transmitter RF Output Power - DSB-AM, 15 Watt Power Output	The MDR transmitter shall be adjustable in 0.5 dB steps over the range from 2 watts to 15 watts.	D	DMPO	
126	3.2.2.2. 5.2 a) 3)	Transmitter RF Output Power - DSB-AM, 15 Watt Power Output	The MDR transmitter shall deliver not less than 50 percent of the set CW RF signal power into any impedance having a maximum VSWR of 3:1 at any phase angle.	T	TARF	
128	3.2.2.2. 5.2 b) 1)	Transmitter RF Output Power - DSB-AM, 50 Watt Power Output	The MDR transmitter shall deliver the RF power output specified in Control Parameter #12, Power Output, into a nominal 50 ohm load impedance when transmitting a CW signal.	T	TARF	

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129	3.2.2.2. 5.2 b) 2)	Transmitter RF Output Power - DSB-AM, 50 Watt Power Output	The MDR transmitter shall be adjustable in nominal 0.5 dB steps over the range from 10 watts to 50 watts maximum unmodulated CW RF power.	D	DMPO	
130	3.2.2.2. 5.2 b) 3)	Transmitter RF Output Power - DSB-AM, 50 Watt Power Output	The MDR transmitter shall deliver not less than 50 percent of the set CW RF signal power into any impedance having a maximum VSWR of 3:1 at any phase angle.	T	TARF	
131	3.2.2.2. 5.3 a)	TDMA Slot Power Setting Requirements	The MDR transmitter shall have the ability to change the power in each TDMA slot for VDL Mode 3 operation.	T	TVRF	
134	3.2.2.2. 5.4 a)	Transmitter Leakage - VDL Mode 3 and DSB-AM	When unkeyed, the MDR transmitter shall not produce more than -97 dBm in-band leakage when measured at the MDR RF output.	T	TXTL	Only verified in DSB-AM
135	3.2.2.2. 6 a)	Transmitter Back Intermodulation - VDL Mode 3 and DSB-AM	In the fixed tuned configuration, the amplitude of each radio frequency back intermodulation product shall be at least 40 dB below the amplitude of an interfering signal fed into the MDR RF output at either: 1) 28 dB below the transmitter maximum output level and spaced +/- 2 MHz from the MDR transmitter output frequency or 2) 42 dB below the transmitter maximum output level and spaced +/- 500 kHz from the MDR transmitter output frequency.	T	TXIM	Only verified in DSB-AM
136	3.2.2.2. 7.1 a)	Transmitter Duty Cycle - VDL Mode3	The MDR transmitter shall operate at a 79.5 percent duty cycle at the maximum rated output continuously, for at least 8,760 hours.	T	TXDC	OCT limited to a min of 24hrs.
137	3.2.2.2. 7.2 a)	Transmitter Duty Cycle - DSB-AM	The MDR transmitter shall operate at a 100 percent duty cycle at the maximum rated output continuously for at least 8,760 hours.	T	TXDC	OCT limited to a min of 24hrs.
138	3.2.2.2. 8 a)	Transmitter Spurious Emissions - VDL Mode 3 and DSB-AM	Spurious emission levels shall meet the limits imposed by the transmit mask of Section 3.2.2.2.10.	T	TAAP/TVAP	TAAP - DSB-AM/TVAP VDL Mode 3
139	3.2.2.2. 9 a)	Transmitter Harmonic Output - VDL Mode 3 and DSB-AM	The level of each harmonic frequency of the carrier shall be less than -80.0 dBc (-65 dBm within the Global Navigation Satellite System (GNSS) band) when measured at the MDR RF output.	T	TXHO	Only verified in DSB-AM
140	3.2.2.2.10 a) 1)	Transmitter Adjacent Channel Power	15 Watt and 50 Watt Configuration, Fixed-Tuned Configuration, VDL Mode 3 and DSB-AM Modulated 90 Percent with a 1004 Hz Tone While in a fixed tuned configuration, the amount of power from an MDR transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the first adjacent channel shall not exceed -40 dBc (-62 dBc in center 16 kHz).	T	TAAP/TVAP	TAAP - DSB-AM/TVAP VDL Mode 3

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
141	3.2.2.2.10 a) 2)	Transmitter Adjacent Channel Power	15 Watt and 50 Watt Configuration, Fixed-Tuned Configuration, VDL Mode 3 and DSB-AM Modulated 90 Percent with a 1004 Hz Tone The amount of power from an MDR transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the second and third adjacent channels shall be -65 dBc maximum, -70 dBc maximum for the fourth through seventh adjacent channels, -75 dBc maximum for the eighth through fifteenth adjacent channels, -92 dBc maximum for the sixteenth through nineteenth adjacent channels, and -113 dBc maximum for any frequency greater than 500 kHz from the tuned channel center and –137 dBc maximum for any frequency greater than 2 MHz from the tuned channel center.	T	TAAP/TVAP	TAAP - DSB-AM/TVAP VDL Mode 3, See Figure 3-1
142	3.2.2.2.11.2 a)	Transmitter Carrier-Induced Noise (Residual AM) - DSB-AM	The carrier induced audio noise level due to the MDR transmitting a CW signal shall be at least 40.0 dB below the detected audio output (300 Hz - 3.0 kHz detected bandwidth) when the carrier is modulated 90 percent with a 1004 Hz tone.	T	TACN	
143	3.2.2.2.12.2 a)	Transmitter Keying - DSB-AM	The MDR transmitter shall accept both local and remote keying signals.	T	TALK	
144	3.2.2.2.12.2 b)	Transmitter Keying - DSB-AM	The local keying signal shall be via a push-to-talk microphone connected directly to the transmitter front panel microphone jack.	T	TALK	
145	3.2.2.2.12.2 c)	Transmitter Keying - DSB-AM	Remote keying signals shall be via the application of a ground, or alternately, +6 VDC to +48 VDC.	T	TAKY	
146	3.2.2.2.12.2 d)	Transmitter Keying - DSB-AM	The remote keying signals for current or voltage control shall be on separate pins of the MDR transmitter remote connector.	T	TAKY	
147	3.2.2.2.12.2 e)	Transmitter Keying - DSB-AM	Remote keying signals shall take priority over local keying signals when the MDR transmitter is on-line.	T	TALK	
148	3.2.2.2.12.2 f)	Transmitter Keying - DSB-AM	For ground keying, the source current required shall not exceed 10 milliamperes and not generate a pull-up voltage exceeding 40 volts.	T	TAKY	
149	3.2.2.2.12.2 g)	Transmitter Keying - DSB-AM	The keying time shall not exceed 15 milliseconds as measured from the application of a keying signal to the time when the MDR transmitter is at 90 percent of the full power level.	T	TAKT	
150	3.2.2.2.12.2 h)	Transmitter Keying - DSB-AM	The MDR transmitter shall continue to transmit while the keying signal is present per item 3.2.2.2.12.2c above.	T	TAKY	
151	3.2.2.2.12.2 i)	Transmitter Keying - DSB-AM	The sink current shall not exceed 0.5 mA with voltage keying.	T	TAKY	
152	3.2.2.2.13 a)	Transmitter Frequency Tolerance - VDL Mode 3 and DSB-AM	The MDR transmitter frequency tolerance shall be +/- 0.0001 percent (+/-1.0 ppm) of the Current Frequency (See Table 3-3, ID#2) for any period of one year following alignment over the full frequency range specified in Section 3.2.1.1.1, and the temperature range specified in Section 3.4.3.1.	A	ALOF	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
157	3.2.3. 1 a)	MDR Control	The MDR control functions shall support real-time system management actions from the following two control points when the MDR is in the Online and Offline state: 1. Maintenance Data Terminal (MDT) connector located on the front of the MDR receiver and transmitter provides local control. 2. RIU data connector located on the rear of the MDR receiver and transmitter provides remote control.	D	DMCP	RIU not verified in this test case
158	3.2.3. 1.1 a)	MDT Interface	The MDR shall accept control input and provide control replies and monitoring output and alarm/alert indications via the MDT connector.	D	DMAP/DMCP/DMMR	
160	3.2.3. 1.1 b)	MDT Interface	The MDR shall continue to operate with an MDT connected, logged in, and upon removal of the MDT.	D	DMDS	
161	3.2.3. 1.2 a)	Remote Maintenance Monitoring and Control	The MDR/RIU shall accept control input from the RIU and provide control replies, monitoring output and alarm/alert indications to the RIU via the MDR/RIU connector.	LL	None	Must meet Test Cases IMCP and IMMP.
163	3.2.3. 2 a)	Control Parameter Adjustments	The MDR shall allow modification of the control parameters of the MDR receiver and transmitter summarized in Table 3-3.	D	DMCP	
169	3.2.3. 3 a)	MDR Monitoring and Reporting	The MDR monitoring function shall perform real-time system performance monitoring and provide real-time system performance reporting when the MDR is in the Offline or Online state.	D	DMMR	
171	3.2.3. 3 d)	MDR Monitoring and Reporting	There shall be three instances where monitoring messages are sent to the local MDT and to the RIU: 1) Upon request via a Control message with parameter ID#30, 2) When an alert or alarm threshold is crossed, and 3) When a monitored parameter returns to a value within the normal range.	D	DMMR	
172	3.2.3. 3 e)	MDR Monitoring and Reporting	The alert or alarm status messages shall be sent within 4 seconds of when the parameter being monitored crosses the threshold level.	D	DMMR	
173	3.2.3. 3.1 a)	Non-Congesting Monitoring	The MDR shall monitor automatically on a continuous basis without blocking or delaying operational communications and management and without the need for the insertion of an external command.	D	DMMR	
174	3.2.3. 3.1 b)	Non-Congesting Monitoring	The MDR monitoring shall not cause the MDR function to degrade below requirements during operation of the system.	A	AVPM	
175	3.2.3. 3.1 c)	Non-Congesting Monitoring	Regardless of the frequency of alarm and alert status messages, the MDR monitoring function shall not prevent the reception and processing of commands.	A	AVPM	
176	3.2.3. 3.2 a)	Alarm/Alert Monitoring Suppression	The MDR receiver and transmitter shall suppress alarm and alert status messages to the MDT and RIU upon command.	D	DMAP	RIU not verified in this test case

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
177	3.2.3. 3.2 b)	Alarm/Alert Monitoring Suppression	The MDR receiver and transmitter shall send the alert event acknowledging the command to suppress alarm and alert status messages before suppressing alarm and alert radio monitoring messages.	D	DMAP	
179	3.2.3. 4 a)	Alarm/Alert Processing	The MDR parameters to be monitored shall be described by three monitored parameter states: 1) Normal 2) Alert 3) Alarm	D	DMAP	
180	3.2.3. 4 b)	Alarm/Alert Processing	The monitored parameter states shall be defined by a range of values that are adjoined such that value ranges of the alert state is bordering on the normal state at one end of its range and the alarm state on the other side of its range.	D	DMAP	
182	3.2.3. 4 d)	Alarm/Alert Processing	The MDR shall determine the change between normal state, alert state, and alarm state of MDR status parameters by comparing data to pre-established thresholds.	D	DMAP	
184	3.2.3. 4 f)	Alarm/Alert Processing	The MDR shall automatically declare an alert event when a monitored parameter and/or element status changes to a value that is outside the normal operating range but within the alert range.	D	DMAP	
185	3.2.3. 4 g)	Alarm/Alert Processing	The alert event shall be reported once per occurrence with the PRI field set to 1.	D	DMAP	
186	3.2.3. 4 i)	Alarm/Alert Processing	The MDR shall automatically declare a return to normal event when a monitored parameter and/or element status that was previously outside the normal range changes to a value that is inside the normal range.	D	DMAP	
187	3.2.3. 4 j)	Alarm/Alert Processing	The return to normal event shall be reported once per occurrence with the PRI field set to 0.	D	DMAP	
188	3.2.3. 4 k)	Alarm/Alert Processing	The MDR shall automatically declare an alarm event when a monitored parameter and/or element status changes to a value crossing from the alert range to the alarm range.	D	DMAP	
189	3.2.3. 4 l)	Alarm/Alert Processing	The alarm event shall be reported once per occurrence with the PRI field set to 2.	D	DMAP	
190	3.2.3. 4 n)	Alarm/Alert Processing	The MDR shall automatically declare a state change event when the value changes for a monitored parameter and/or element status that indicates a configuration or mode change to the MDR.	D	DMAP	
191	3.2.3. 4 o)	Alarm/Alert Processing	The MDR State change event shall be reported once per occurrence with the PRI field set to 1.	D	DMAP	
193	3.2.3. 4 p)	Alarm/Alert Processing	The MDR shall provide unsolicited radio monitoring message notification within 4 seconds of alarm/alert occurrence.	D	DMAP	
195	3.2.3. 5 b)	MDR Monitoring Parameters	The MDR receiver and transmitter shall monitor the parameters summarized in Table 3-4.	D	DMMR	See Table 3-4

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
211	3.2.3.10 a)	Vendor Built In Test	The vendor shall make their built-in test accessible to the FAA.	D	DBIT	
212	3.3.1 a)	Legacy Interfaces Between RCE and MDR	MDR receiver and transmitter equipment shall support the existing interfaces for remote receiver interfaces, remote transmitter interfaces, local receiver audio and local microphone.	LL	None	Must meet FAA-E-2938 Shalls #217, 220, 219, and 221.
213	3.3.1.1 a)	RF Connectors	External Radio Frequency (RF) connectors shall be 50 ohm coaxial type N female.	I	PCON	
214	3.3.1.2 a)	Electrical Input Power Connectors	Electrical input power connectors shall be of the following male types: two conductor polarized for DC inputs and three-conductor National Electrical Manufacturers Association (NEMA) type for AC inputs.	I	PCON	
215	3.3.1.2 b)	Electrical Input Power Connectors	Both power connectors shall conform to FAA-G-2100.	I	PCON	
216	3.3.1.3 a)	Receiver Remote Connector	This electrical connector shall be located on the rear of the MDR receiver.	I	PCON	
217	3.3.1.3 b)	Receiver Remote Connector	Signals and their levels shall be as below: (See Table in Section 3.3.1.3 b)	T	RAAC/RAIF	RAAC - General verification of #217
218	3.3.1.4 a)	Transmitter Remote Connector	This electrical connector shall be located on the rear of the MDR transmitter.	I	PCON	
219	3.3.1.4 b)	Transmitter Remote Connector	Signals and levels shall be as below: (See table in Section 3.3.1.4 b)	T	TAKY/TAML	
220	3.3.1.5 a)	Receiver Local Headset Connection	The MDR receiver local headset connector shall be located on the front panel of the MDR receiver and interface with a type NT49985A or equivalent headset.	I	PCON	
221	3.3.1.6 a)	Transmitter Local Microphone Connection	The MDR transmitter local microphone connector shall be located on the front panel of the MDR transmitter and mate with plug type PH068 for use with either an M85/U carbon microphone, or equivalent, or with a MS3106A-14S-5S dynamic microphone or equivalent.	I	PCON	
222	3.3.2.1 a)	MDT Connector	The connector for the MDT shall be located on the front panel of the MDR receiver and transmitter.	I	PCON	
223	3.3.2.1 b)	MDT Connector	The connector shall be a female DB-9, RS-232 serial interface.	I	PCON	
224	3.3.2.2 a)	RIU Connector	The MDR receiver and transmitter shall each have a single digital data bus interfacing with the RIU.	I	PCON	
225	3.3.2.2 c)	RIU Connector	The connector for the RIU shall be located on the rear of the MDR receiver and transmitter.	I	PCON	
226	3.3.2.2 d)	RIU Connector	The connector shall be a female RJ-48.	I	PCON	
227	3.3.1.1.1 a)	MDR RF Connector	The MDR RF connector shall be used for the transmitter output and receiver input.	I	PCON	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
239	3.4.1.1. 1 a)	Workmanship	Workmanship shall be in accordance with the requirements of this specification, FAA-G-2100, and MIL-HDBK-454, Guideline 9.	A	AWRK	
252	3.4.1.1. 2 a)	Equipment Size	The MDR receivers and transmitters shall be constructed to allow for installation into a standard EIA 19" equipment rack.	I	PMEC	
253	3.4.1.1. 2 b)	Equipment Size	Mounting hole dimensions, spacing, and panel size shall be as specified in EIA-310E (old designation EIA-RS-310D).	I	PMEC	
254	3.4.1.1. 2 c)	Equipment Size	Each MDR receiver shall not exceed 2 units in height and 18.5 inches in depth.	T	PS&W	
255	3.4.1.1. 2 d)	Equipment Size	Each 15 watt MDR transmitter configuration or single enclosure MDR transmitter shall not exceed 3 units in height and 18.5 inches in depth.	T	PS&W	
256	3.4.1.1. 2 e)	Equipment Size	Each 50 watt MDR transmitter configuration shall not exceed 4 units in height and 18.5 inches in depth.	T	PS&W	
257	3.4.1.1. 3 a)	Equipment Weight	The individual MDR receiver and transmitter weight shall not exceed 37 pounds for each unit in accordance with FAA-G-2100, Section 3.3.6.3, male and female maximum weight lift.	T	PS&W	
258	3.4.1.1. 4 a)	Equipment Slides	The MDR equipment shall allow access to control, monitoring and maintenance activities with the equipment bolted to the standard FAA equipment rack.	I	PMEC	
259	3.4.1.1. 4 b)	Equipment Slides	The MDR equipment shall include slides that: 1) extend the MDR equipment the full length of the MDR equipment 2) have end-stops that prevent over-extension 3) meet FAA-G-2100, Section 3.1.2.4.3 4) have the slide component attached to the MDR be separable, without tools, from the slide-component that will be attached to the equipment rack.	I	PMEC	
260	3.4.1.1. 5 a)	Nameplates	Each MDR receiver and transmitter furnished shall have a nameplate mounted on the front of the chassis as specified in FAA-G-2100, section 3.3.3.1 and associated Subsections.	I	PF&L	
261	3.4.1.1. 6 a)	Pin Layout Identification	Numbering or lettering on, or immediately adjacent to, the connectors shall identify all connector pins.	I	PF&L	
264	3.4.1.1. 7 a)	MDR Installation/Removal	The MDR receiver and transmitter shall be constructed to be installed, removed, and reinstalled with a minimum of common tools and without extensive disassembly.	I	PMEC	
265	3.4.1.1. 8 a)	MDR Set Up	The MDR receiver and transmitter shall be initially set up and adjusted under normal operating conditions (see Section 3.4.3.1), following the procedures in the technical instruction book.	D	DSWU	
266	3.4.1.1. 9 a)	MDR Warm-up	The MDR receiver and transmitter shall meet the requirements of full power operation within 30 seconds of turn on.	D	DSWU	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
267	3.4.1.1.10 a)	Thermal Protection	The MDR receiver and transmitter shall not be damaged by over-temperature/over-heat conditions.	A	AENV	
268	3.4.1.1.10 b)	Thermal Protection	The thermal circuit shall not cause a reduction in operation (power output) when operating within the duty cycle and environmental conditions specified.	A	AENV	
269	3.4.1.1.11 a)	Shock and Vibration Protection	Shock and vibration protection shall conform to MIL-STD-810, Method 516.3, Procedure VI-Bench Handling.	A	AS&V	
270	3.4.1.1.11 b)	Shock and Vibration Protection	In all cases, no fixed part shall become loose.	A	AS&V	
271	3.4.1.1.11 c)	Shock and Vibration Protection	No movable part or permanently set adjustment shall shift its setting or position.	A	AS&V	
272	3.4.1.1.11 d)	Shock and Vibration Protection	No degradation in MDR receiver and transmitter performance shall occur under the environmental service and operational conditions specified herein.	A	AS&V	
273	3.4.1.1.12 a)	Grounding, Bonding, and Shielding	The MDR receiver and transmitter grounding, bonding, and shielding protection shall be as specified in FAA-STD-020B, sections 3.8, 3.9, and 3.10, and associated Subsections.	A	AGBS	
275	3.4.1.1.13 b)	Acoustical Noise Criteria Requirement	Sound pressure and acoustic noise levels generated by the MDR equipment in normal operation shall not exceed the limits as specified in FAA-G-2100, section 3.3.6.1, Subsection c.	A	AANC	
278	3.4.1.1.14 b)	Material, Processes, and Parts	The components shall be equal to or better than those components meeting the applicable EIA standards and suitable for the purpose intended.	A	AMPP	
279	3.4.1.1.14 c)	Material, Processes, and Parts	All parts used in the MDR receiver and transmitter shall be operated within their electrical ratings and the environmental requirements of this specification.	A	AMPP	
280	3.4.1.1.14.1 a)	Ferrous Materials	Ferrous materials, if used, shall be corrosion-resisting types.	A	AMPP	
285	3.4.1.1.14.3 a)	Arc-resistant Materials	Arc-resistant materials shall be used for insulation of electrical power circuits where arcing is likely to occur.	A	AMPP	
286	3.4.1.1.14.4 a)	Dissimilar Metals	Selection and protection of dissimilar metal combinations shall be in accordance with FAA-G-2100, section 3.3.1.1.1 and MIL-STD-889.	A	AMPP	
287	3.4.1.1.14.5 a)	Fibrous Material	Fibrous material shall not be used.	A	AMPP	
288	3.4.1.1.14.6 a)	Flammable Materials	Flammable materials shall not be used without prior FAA approval in accordance with FAA-G-2100, section 3.3.1.1.3.	A	AMPP	
290	3.4.1.1.15 a)	Safety	An MDR equipment malfunction shall in no way contribute to the destruction of the equipment or any part of its environment.	A	ASAF	
291	3.4.1.1.15 b)	Safety	Safety shall conform to the requirements of FAA-G-2100, section 3.3.5 and associated Subsections.	A	ASAF	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
292	3.4.1.1.16 a)	Human Performance/Human Engineering	The MDR receiver and transmitter shall conform to the applicable criteria contained in FAA-G-2100, section 3.3.6 and the FAA Human Factors Design Guide.	A	AHPE	
295	3.4.1.1.17 b)	Removable Parts and Mating Connectors	When two or more pieces of equipment require interconnection, the necessary mating connectors (except coaxial) shall be supplied for both the MDR and associated equipment that interfaces with the MDR in accordance with FAA-G-2100, section 3.1.2.1.	I	PREM	
297	3.4.1.2.1 a)	Frequency Change Time	The time required to completely retune the receiver or transmitter to a new frequency, including any required realignment shall not exceed 30 minutes including retuning of the internal filters.	D	DSFQ	DSB-AM Only
298	3.4.1.2.1 b)	Frequency Change Time	MDR receivers and transmitters shall include protective features to guard against inadvertent frequency changes.	D	DSFQ	DSB-AM Only
299	3.4.1.2.2 a)	Detents	The controls with an "OFF" position shall have a detent or equivalent in the ON position to prevent inadvertent operation.	I	PDSP	
300	3.4.1.2.3 a)	Adjustment Range	The adjustment range of the MDR receiver and transmitter operator and maintenance controls shall be constructed to preclude damage to the equipment or its subassemblies when adjusted to the limits of the control travel.	A	AARG	
301	3.4.1.2.3 b)	Adjustment Range	The range of control shall be constructed to reduce the sensitivity and criticality of the adjustment task to the maximum extent possible.	A	AARG	
302	3.4.1.2.4 a)	Power Switches/Power On Indicators	The MDR receiver and transmitter shall have a front panel mounted AC and DC power switches and a Primary Power Source Selector switch next to or in between these power switches.	I	PDSP	
305	3.4.1.2.4 e)	Power Switches/Power On Indicators	Power switches shall have detents in order to avoid inadvertent action (operation).	I	PDSP	
306	3.4.1.2.5 a)	Front Panel Display	The MDR receiver and transmitter front panel shall provide 1) a alphanumeric display of the frequency, mode of operation, and operational state 2) three separate visual indicators (e.g. LEDs) for quick-look status	I	PDSP	
307	3.4.1.2.5 e)	Front Panel Display	The front panel alphanumeric display shall be back-lit, and viewable for at least +/- 30 degrees off horizontal or vertical axis.	I	PDSP	
309	3.4.1.2.6 a)	Functions and Labeling	Labeling shall be permanent, legible, and mounted so that the data are visible to personnel without the need for disassemble the part or adjacent functional or structural parts.	I	PF&L	
310	3.4.1.2.6 b)	Functions and Labeling	Connectors shall be identified on the plug-in side by labels that describe their specific functions.	I	PF&L	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
311	3.4.1.2.6 c)	Functions and Labeling	All fuse positions shall be marked with the rated current capacity, voltage rating, and type of fuse to be used.	I	PF&L	
312	3.4.1.2.6 d)	Functions and Labeling	Delayed action fuses shall have the additional designation "SLOW".	I	PF&L	
313	3.4.1.2.6 e)	Functions and Labeling	All fuse markings shall be on the insertion side, so as to be visible when replacing fuses.	I	PF&L	
314	3.4.1.2.6 f)	Functions and Labeling	The following functions and corresponding labels shall be available on the MDR receiver or transmitter as specified in Table 3-5:	I	PF&L	See Table 3-5
316	3.4.2.1 a)	Input Power Requirements	The MDR equipment shall meet the requirements of this specification with primary line input voltage of 120 VAC (+/-10 percent), 60 Hz (+/-3 Hz) single phase and with an alternate line input voltage of 24 VDC, negative ground, (-10/+20percent).	T	SYIP	
317	3.4.2.1 b)	Input Power Requirements	During the loss of primary power (or non-availability of primary power) the equipment shall automatically switch to operating off secondary power.	T	SYIP	
318	3.4.2.1 c)	Input Power Requirements	Activation of this internal automatic line switchover shall allow for equipment operation from a secondary DC power source.	T	SYIP	
319	3.4.2.1 d)	Input Power Requirements	The MDR equipment shall operate under varying conditions, such as slow variations of AC and DC line voltages and AC line frequency, within the ranges specified herein.	T	SYIP	
320	3.4.2.1 e)	Input Power Requirements	The MDR equipment shall automatically resume normal operation when subjected to power interruptions and/or outages as called out by FAA-G-2100, Section 3.1.1.8.	T	SYIP	
321	3.4.2.1 f)	Input Power Requirements	Both AC and DC voltage inputs shall be from the rear of the MDR equipment, and when practical, be located on the lower right side of the equipment as viewed from the rear.	I	PCON	
322	3.4.2.1 g)	Input Power Requirements	The maximum current draw for the MDR equipment shall be as listed in Table 3-6.	T	SYIP	See Table 3-6
323	3.4.2.1.1 a)	Power Cords	The equipment shall be provided with: 1) a removable six foot, three conductor AC power cord and 2) a removable six foot, two conductor DC power cord, each matching with the respective connector on the MDR receiver and transmitter.	I	PCON	
324	3.4.2.1.1 b)	Power Cords	The AC cord(s) shall have the AC protection ground lead configured to ground the chassis as specified in FAA-G-2100, Section 3.1.1.9.	I	PCON	
325	3.4.2.2 a)	Reverse Polarity Protection	The MDR receiver and transmitter shall incorporate reverse polarity protection to prevent damage to the equipment if the polarity of the 24 VDC input voltage is reversed.	T	SYIP	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
326	3.4.2.3 a)	Circuit Protection	All MDR receiver and transmitter input/output circuits shall include circuit protection, which prevents opens or shorts at the input/output terminals from damaging the equipment.	T	SYSC	
327	3.4.2.3 b)	Circuit Protection	When the short or open is removed, circuit performance shall show no sign of performance degradation in accordance with FAA-G-2100, Section 3.1.1.7.	T	SYSC	
328	3.4.2.3.1 a)	Current Overload Protection	Current overload protection for the MDR receiver and transmitter shall be provided by fuses, circuit breakers, or other protective devices for primary input AC and DC circuits as specified in FAA-G-2100, Section 3.3.1.3.2 and associated Subsection.	I	PELC	
329	3.4.2.3.2 a)	Protective Caps	Protective caps for mating with normally unmated or infrequently used connectors (i.e., local microphone input jacks or test/diagnostic input/output connectors) on the MDR receiver and transmitter shall be provided in accordance with FAA-G-2100, Section 3.3.1.3.3.4.	I	PELC	
331	3.4.2.3.3 b)	Electrostatic Discharge Control	All circuits and components used in the equipment that are susceptible to damage by ESD shall be protected as specified in FAA-G-2100, Section 3.2.7 and FAA-STD-020B, Section 3.12.3.	A	AESD	
332	3.4.2.3.4 a)	AC Harmonic Content	The total harmonic content of the MDR receiver or transmitters current shall not produce a total harmonic distortion (THD) that exceeds 5 percent of the fundamental (AC at 60 Hz) source current.	T	SYAC	
333	3.4.2.3.4 b)	AC Harmonic Content	No single harmonic shall be greater than 3 percent of the fundamental (AC at 60 Hz) source power current.	T	SYAC	
334	3.4.2.3.5 a)	AC Inrush Current Limiting	The MDR receiver and transmitter AC inrush current characteristics (in all of the equipment configurations) shall not exceed 1.5 times overcurrent shown in Figure 3-3.	T	SYAC	See Figure 3-3
335	3.4.2.3.5 b)	AC Inrush Current Limiting	The duration of the inrush current shall be measured from the point at which the power is turned on to the point to which the current returns within 110 percent of its normal value.	T	SYAC	
336	3.4.2.3.6 a)	AC Power Factor	The MDR receiver and transmitter (in all of their configurations) shall present a power factor to the AC power source of not less than 0.7 leading or lagging when operating under steady state conditions, from 25 percent to 100 percent of full load at the nominal line voltage (120VAC).	T	SYAC	
337	3.4.2.3.7 a)	Transient Protection	The MDR receiver and transmitter shall contain protective devices in the audio circuits that conform to IEEE/ANSI Standards C62.36-1994, (Surge Protectors Used in Low-voltage Data, Communications, and Signaling Circuits), in the RF circuits that conform to IEEE/ANSI Standards C62.31-1987, (Gas-Tube Surge-Protective Devices), and in the AC power circuits that conform to IEEE/ANSI Standards C62.41-1991, (IEEE Recommended Practice on Surge Voltages in Low-voltage AC Power Circuits).	A	AESD	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
338	3.4.2.3.7 b)	Transient Protection	The MDR receiver and transmitter shall provide overall unit protection as outlined in IEEE/ANSI Standard C62.47-1992, (IEEE Guide on Electrostatic Discharge (ESD).	A	AESD	
340	3.4.2.4 a)	Test Points	External test points shall be female BNC type connectors.	I	PCON	
344	3.4.2.6 a)	Loss of Input Voltage	The loss or variance of input voltage, including loss of voltage caused by activation of circuit protector devices, shall not cause or induce any damage to any component in the MDR receiver and transmitter or other interfacing equipment.	T	SYLV	
345	3.4.3 a)	Environmental Conditions	The MDR receiver and transmitter shall be constructed of materials to withstand any combination of environmental and service conditions specified below without causing damage or degradation of performance below the requirements of this specification.	A	AENV	
346	3.4.3.1 a)	Operating Conditions	The MDR receiver and transmitter shall be able to operate in a facility under the operating conditions specified in Table 3-7:	A	AENV	See Table 3-7
347	3.4.3.2 a)	Non-Operating Conditions	The MDR equipment shall meet the requirements for a non-operating conditions in Table 3-8:	A	AENV	See Table 3-8
351	3.4.3.3 c)	Equipment Ventilation and Cooling	The MDR front panel shall not present a thermal contact hazard to personnel in accordance with FAA Human Factors Guide, Section 12.10.1.	A	AHPE	
352	3.4.4 b)	Electromagnetic Compatibility	Electromagnetic emission and susceptibility of the MDR receiver and transmitter shall not exceed the limits in MIL-STD-461 requirements CE-102, CS-101, CS-114, CS-115, CS-116, RE-102 and RS-103.	A	AEMC	
353	3.5.1.1 a)	Mean Time Between Failure	The predicted Mean Time Between Failure (MTBF) for the MDR receiver and transmitter shall be not less than 26,280 hours.	A	AMTB	
354	3.5.2 a)	Maintainability	The MDR receiver and transmitter shall provide parameter adjustments for routine maintenance.	A	AMTB	
355	3.5.2 b)	Maintainability	The MDR receiver and transmitter each shall be an LRU.	A	AMTB	
357	3.5.2.1 a)	Mean Time To Repair	The Mean Time To Repair (MTTR) of the MDR (receiver and transmitter) shall not be greater than 30 minutes at the site (LRU replacement).	A	AMTB	
363	3.5.2.2 a)	Periodic Maintenance	The MDR receiver and transmitter shall be configured so periodic maintenance can be performed without disrupting the on-line component.	A	AMTB	
364	3.5.2.2 b)	Periodic Maintenance	Periodic maintenance intervals shall meet or exceed one year.	A	AMTB	
365	3.5.3 a)	Service Life	The MDR receiver and transmitter shall have a minimum useful service life of 20 years.	A	AMTB	
367	3.2.2.1. 3 a)	Receiver Sensitivity	The MDR receiver RF input shall have a 50 ohm characteristic impedance.	T	RASN	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
368	3.2.2.1. 9 b)	Receiver Audio Output Control	With an RF input consisting of a -87 dBm carrier AM modulated 30 percent with a 1004 Hz tone, the front panel headphone jack audio level shall be continuously adjustable with the front panel volume control from –25 dBm to +20 dBm.	T	RAAC	
369	3.2.2.1.23.2 a)	Receiver Frequency Capture Range - DSB-AM	The MDR receiver shall meet the sensitivity requirement of Section 3.2.2.1.3 with a maximum carrier frequency offset of +/- 885 Hz from nominal for air/ground communications.	T	RACP	
370	3.2.2.1.24.2 a)	Receiver Doppler Rate - DSB-AM	The MDR receiver shall meet the sensitivity requirement of Section 3.2.2.1.3 with a carrier frequency change rate of 18 Hz/s within the entire range of Doppler shift +/- 200 Hz .	A	ARDP	
371	3.2.2.2. 1 d)	Transmitter Digital and Audio Interfaces	The MDR transmitter shall receive a PTT signal from the RCE for analog voice originating from the control site.	T	TALK	
373	3.2.2.2.12.2 j)	Transmitter Keying - DSB-AM	An open keyline shall be interpreted an non-keyed.	T	TAKY	
374	3.2.2.2.14 a)	ATR Operation	The MDR transmitter shall include an ATR function, supported in both DSB-AM and VDL Mode 3 modes, which connects the local MDR and remote MDR to a single antenna.	A/T	AATR/SATR	AATR - for VDL Mode 3, SATR - for DSB-AM
375	3.2.2.2.14 b)	ATR Operation	The ATR shall support the following antenna configurations: 1) Transmitter/Receiver on the same frequency for transceiver (T/R) operation (see example in Figure 6-3); 2) Transmitter/Transmitter on the same frequency for main/standby (TX M/S) operation (see example in Figure 6-4).	T	SATR	
376	3.2.2.2.14 d)	ATR Operation	In the Dynamic Mode, when the antenna is in use by the local MDR (actively transmitting), the ATRC (common) connector shall be routed to the ATR2 connector.	T	SATR	
377	3.2.2.2.14 e)	ATR Operation	In the Dynamic Mode, when the antenna is not in use by the local MDR, the ATRC (common) connector shall be routed to the ATR1 connector.	T	SATR	
379	3.2.2.2.14 f)	ATR Operation	Failure of the local MDR shall not prevent or degrade the ATRC to ATR1 path (e.g., the failed or default Path is ATRC to ATR1).	T	SATR	
380	3.2.2.2.14 g)	ATR Operation	In the T/R configuration, the ATR shall switch fast enough for interslot and intraslot VDL Mode 3 operation.	A	AATR	
381	3.2.2.2.14 h)	ATR Operation	In the T/R configuration, the ATR shall provide sufficient isolation between the ATR1 and ATR2 connector paths during MDR transmissions (ATRC to ATR2) to prevent signals stronger than –7 dBm from reaching the MDR receiver (ATR1).	T	SATR	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
382	3.2.2.2.14 i)	ATR Operation	In the T/R configuration, the ATR shall provide sufficient leakage from the MDR transmitter (ATR2) to the MDR receiver (ATR1) to allow the MDR receiver(s) to monitor if the MDR transmitter is operating, without damaging the MDR receiver(s).	T	SATR	
383	3.2.2.2.14 j)	ATR Operation	In the TX M/S configuration, the ATR shall provide sufficient isolation between the ATR1 and ATR2 connector paths to prevent damage to the non-radiating transmitter.	T	SATR	
384	3.2.2.2.14 l)	ATR Operation	The ATR operation shall allow for the use of the internal filter and/or an external RF filter in any configuration (see Figures 6-3 and 6-4).	I	PCON	
385	3.2.2.2.14 m)	ATR Operation	The MDR shall be equipped with three external, removable jumpers capable of operational use to provide connectivity between: 1) the MDR RF and ATR2 connectors, 2) the MDR RF to FILTER IN connectors, and 3) the FILTER OUT to ATR2 connectors.	I	PREM	
386	3.4.1.2.7 a)	Filter Tuning	If the internal filter is manually tunable, it shall be tunable via the front panel.	I	PCON	
387	3.2.2.1.17.1 b)	Collocation - VDL Mode 3	While in a remotely tunable configuration, the VDL Mode 3 sensitivity requirements defined in Section 3.2.2.1.3 shall not be degraded by more than 14 dB (-86 dBm) in the presence of an off channel transmitter, keyed, with a 15 watt carrier, DSB-AM modulated 90 percent with a 400 Hz tone or a 15 watt VDL Mode 3 transmitter with four slots active and in time synchronization with the desired signal, when the frequency separation and transmit-receive path isolation in Case A below is provided.	T	RVCO	
388	3.2.2.1.17.1 c)	Collocation - VDL Mode 3	While in a remotely tunable configuration, the VDL Mode 3 sensitivity requirements defined in Section 3.2.2.1.3 shall not be degraded by more than 28 dB (-72 dBm) in the presence of an off channel transmitter, keyed, with a 15 watt carrier, DSB-AM modulated 90 percent with a 400 Hz tone or a 15 watt VDL Mode 3 transmitter with four slots active and in time synchronization with the desired signal, when the frequency separation and transmit-receive path isolation in Case B below is provided.	T	RVCO	
389	3.2.2.1.17.2 b)	Collocation - DSB-AM	While in a remotely tunable configuration, the DSB-AM sensitivity requirements defined in Section 3.2.2.1.3 shall not be degraded by more than 16 dB (-86 dBm) in the presence of an off channel transmitter, keyed, with a 15 watt carrier, DSB-AM modulated 90 percent with a 400 Hz tone or in the presence of a 15 watt VDL Mode 3 transmitter with four slots active, when the frequency separation and transmit-receive path isolation in Case A below is provided.	T	RACO	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
390	3.2.2.1.17.2 c)	Collocation - DSB-AM	While in a remotely tunable configuration, the DSB-AM sensitivity requirements defined in Section 3.2.2.1.3 shall not be degraded by more than 30 dB (-72 dBm) in the presence of an off channel transmitter, keyed, with a 15 watt carrier, DSB-AM modulated 90 percent with a 400 Hz tone or in the presence of a 15 watt VDL Mode 3 transmitter with four slots active, when the frequency separation and transmit-receive path isolation in Case B below is provided.	T	RACO	
391	3.2.2.2.10 b) 1)	Transmitter Adjacent Channel Power	15 Watt and 50 Watt Configuration, Remotely-Tunable Configuration, VDL Mode 3 and DSB-AM Modulated 90 Percent with a 1004 Hz Tone While in a remotely tunable configuration, the amount of power from an MDR transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the first adjacent channel shall not exceed -40 dBc (-62 dBc in center 16 kHz).	T	TAAP/TVAP	TAAP - DSB-AM/TVAP VDL Mode 3
392	3.2.2.2.10 b) 2)	Transmitter Adjacent Channel Power	15 Watt and 50 Watt Configuration, Remotely-Tunable Configuration, VDL Mode 3 and DSB-AM Modulated 90 Percent with a 1004 Hz Tone The amount of power from an MDR transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the second and third adjacent channels shall be -65 dBc maximum, -70 dBc maximum for the fourth through seventh adjacent channels, -75 dBc maximum for the eighth through fifteenth adjacent channels, -92 dBc maximum for the sixteenth through nineteenth adjacent channels, and -107 dBc maximum for any frequency greater than 500 kHz from the tuned channel center.	T	TAAP/TVAP	TAAP - DSB-AM/TVAP VDL Mode 3, See Figure 3-1
393	3.2.2.2.13 b)	Transmitter Frequency Tolerance - VDL Mode 3 and DSB-AM	The reference used to derive the transmitter operating frequency shall have a tuning adjustment adequate to compensate for changes during the operational life of the equipment.	A	ALOF	
395	3.2.2.2.13 c)	Transmitter Frequency Tolerance - VDL Mode 3 and DSB-AM	The transmitter operating frequency shall be adjustable within +/- 1 ppm of the tuned channel center frequency.	A	ALOF	
397	3.2.1.2.2.4 a)	LBACs for the MDR Receiver	The MDR receiver shall use the Time of Arrival (TOA) field to indicate the time offset from the beginning of the VDL Mode 3 6-second epoch where the center of the first symbol of the synchronization sequence occurred for received bursts.	T	ISTC	
399	3.2.1.2.2.4 c)	LBACs for the MDR Receiver	The MDR receiver shall search the VDL Mode 3 synchronization signals using the Sync Search Control message parameters received from the RIU to determine the type of VDL Mode 3 synchronization sequence(s) to search for (STYPE field) as specified in the Table below, and the time window in which to search for the specified synchronization sequence(s) using the S_START and S_STOP fields.	T	ISTC	See Table 3-1A
400	3.2.1.6.1 a)	HDLC Frame Structure	The MDR shall support the HDLC Frame Structure as defined in NAS-IC-41033502.	T	IDLL	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
401	3.2.1.6.2 a)	Link Control	The MDR shall support the link initialization procedures defined in NAS-IC-41033502.	T	ILLI	
402	3.2.1.6.2 b)	Link Control	The MDR shall provide the means to clear the link at any time, in accordance to NAS-IC-41033502.	T	ILCF	
403	3.2.1.6.3 a)	Link Level Parameters	The MDR shall limit the size of HDLC frames across the MDR/RIU link according to the N1 parameter in accordance with NAS-IC-41033502.	T	ILLI	
404	3.2.1.6.4 a)	HDLC Frame Timing	The MDR shall support the timing and size of HDLC frame transmissions between the MDR and RIU, in accordance to NAS-IC-41033502.	T	IHFT	
405	3.2.1.6.5 a)	Link Level Message Description	The MDR shall support the Link Level Message Structure between the MDR and RIU, in accordance to NAS-IC-41033502.	T	ILLI	
406	3.2.1.6.5.1 a)	General Message Structure	The MDR shall support the General Message Structure between the MDR and RIU, in accordance to NAS-IC-41033502.	T	IDBM/ILSM/IMBM /IPVM/IRCM/IRM M/ISCM/IVBM	
407	3.2.1.6.5.1 b)	General Message Structure	The MDR shall support the message types and message ID's, as defined in the Table 3-1B below:	T	IDBM/ILSM/IMBM /IPVM/IRCM/IRM M/ISCM/IVBM	See Table 3-1B
408	3.2.1.6.5.1 c)	General Message Structure	The MDR shall support the field descriptions and message encoding, as defined in NAS-IC-41033502, for each of the message types identified in the Table above.	T	IDBM/ILSM/IMBM /IPVM/IRCM/IRM M/ISCM/IVBM	See Table 3-1B
409	3.2.1.6.5.1.2 a)	Data-Burst (D-Burst) Message	The MDR transmitter shall receive D-burst messages from the RIU (Message ID = 1), encoded as defined in NAS-IC-41033502.	T	IDBM	
410	3.2.1.6.5.1.3 a)	Management-Burst (M-Burst) Message	The MDR transmitter shall receive M-burst messages from the RIU (Message ID = 2), encoded as defined in NAS-IC-41033502.	T	IMBM	
411	3.2.1.6.5.1.4 a)	Sync Search Control Message	The MDR receiver shall receive sync search control messages from the RIU (Message ID = 3), encoded as defined in NAS-IC-41033502.	T	ISCM	
412	3.2.1.6.5.1.5 a)	PCM-Voice Message	The MDR transmitter shall receive PCM-Voice messages from the RIU (Message ID = 4), encoded as defined in NAS-IC-41033502.	T	IPVM	
413	3.2.1.6.5.1.6 a)	Radio Control Message	The MDR shall receive radio control messages from the RIU (Message ID = 5), and respond with messages encoded as defined in NAS-IC-41033502.	T	IRCM	
414	3.2.1.6.5.1.7 a)	Radio Monitoring Message	The MDR shall send radio monitoring messages to the RIU (Message ID = 6), encoded as defined in NAS-IC-41033502.	T	IRMM	
415	3.2.1.6.5.1.8 a)	RIU/MDR Status Message	The MDR shall send/receive RIU/MDR status messages to/from the RIU (Message ID = 7), encoded as defined in NAS-IC-41033502.	T	ILSM	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
416	3.2.1.6.5.1.8 b)	RIU/MDR Status Message	The RIU/MDR status message shall define the status of the MDR or be used by the RIU to complete the link initialization.	T	ILSM	
417	3.2.1.6.6 a)	MDR Receiver HDLC Message Timing	For the first vocoder frame in a VDL Mode 3 received burst (VFSN=1), the V-burst HDLC message shall have the LEN field set to 96.	T	IRHT	
418	3.2.1.6.6 b)	MDR Receiver HDLC Message Timing	For VFSN=1, the MDR receiver shall complete transmission of the V-burst message HDLC end FLAG no later than time: Trxv1 = [[TOA/16+55.5]/10,500] + Tmp + 0.00343 seconds, where Trxv1 is the time offset measured from the start of the 6-second VDL epoch in which the burst was received, TOA is the Time of Arrival as specified in the V-burst message header, and Tmp is the maximum MDR receiver processing time as specified by the MDR manufacturer with Tmp < 8 milliseconds.	T	IRHT	
419	3.2.1.6.6 c)	MDR Receiver HDLC Message Timing	The MDR Receiver shall send the vocoder frames to the RIU in the order in which they are demodulated.	T	IRHT	
420	3.2.1.6.6 d)	MDR Receiver HDLC Message Timing	The MDR Receiver shall complete transmission of the HDLC end FLAG for the V-burst message that contains vocoder frame 6 no later than time: Trxv2-6 = [[TOA/16 + 55.5]/10,500] + 0.030 seconds, where Trxv2-6 is the time offset measured from the start of the 6-second VDL epoch in which the burst was received, and TOA is the Time of Arrival as specified in the V-burst message header.	T	IRHT	
422	3.2.1.6.6 f)	MDR Receiver HDLC Message Timing	The MDR receiver shall complete transmission of the M-Burst message HDLC end FLAG no later than 30 milliseconds after the TOA as specified in the M-burst message header.	T	IRHT	
423	3.2.1.6.6 g)	MDR Receiver HDLC Message Timing	The MDR receiver shall send the data segments to the RIU in the order in which they are demodulated.	T	IRHT	
425	3.2.1.6.6 i)	MDR Receiver HDLC Message Timing	The MDR receiver shall complete transmission of the D-burst message HDLC end FLAG for the last D-burst message segment in a D-burst no later than 30 milliseconds after the TOA as specified in the D-Burst message header.	T	IRHT	
426	3.2.1.7 a)	MDR/RIU Physical Layer	The MDR shall support the fractional T1 protocol as defined in NAS-IC-41033502.	A	AT1P	
427	3.2.1.7.1 a)	T1 Time Slot Assignments	The MDR shall be configurable to use any of one of the five data channels plus the timing channel (slots 1 and 2), in accordance with NAS-IC-41033502.	T	ITSA	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
428	3.2.1.7.2 a)	T1 Time Slots - Timing Channel	The MDR shall support the characteristics of the T1 Timing Channel, in accordance with NAS-IC-41033502.	T	ITTC	
429	3.2.1.7.2 b)	T1 Time Slots - Timing Channel	The MDR shall loop-back to the RIU the information contained in the Timing Channel every T1 frame to allow the RIU to measure the round trip time delay through the telecommunications path between the RIU and MDR.	T	ITTC	
430	3.2.1.7.2 c)	T1 Time Slots - Timing Channel	The looped back Timing Channel shall be delayed in the MDR by a constant time Ttcl+/-10 microsecond tolerance, where Ttcl</= 1 millisecond.	T	ITTC	
432	3.2.1.7.2 e)	T1 Time Slots - Timing Channel	The MDR shall derive all necessary VDL Mode 3 TDMA timing information using the Timing Channel, T1 frame timing, and the MAC Timing Offset Correction messages provided by the RIU.	T	ITTC	
433	3.2.1.7.2 f)	T1 Time Slots - Timing Channel	The MDR shall incorporate the necessary corrections to compensate for internal delays within the radio (e.g., processing delays, FIR filter delays, modulation delays, demodulation delays).	T	ITTC	
434	3.2.1.7.2 g)	T1 Time Slots - Timing Channel	The MDR shall detect this error condition and report it to the RIU.	T	ITTC	
435	3.2.2.1. 1.2.1 a)	DSB-AM PCM Voice Reception	The MDR receiver shall convert demodulated DSB-AM audio to linear Pulse Code Modulation (PCM) at a sampling rate of 8,000 16-bit PCM samples per second with a maximum quantization level corresponding with 100 percent DSB-AM modulation level and send PCM messages to the RIU over the T1 link.	T	IPVM	
436	3.2.2.1. 1.2.1 b)	DSB-AM PCM Voice Reception	The format of the PCM messages sent to the RIU shall be as specified in NAS-IC-41033502.	T	IPVM	
438	3.2.2.1. 1.2.1 c)	DSB-AM PCM Voice Reception	With the exception of the last PCM voice packet in a voice reception, all PCM voice packets sent to the RIU shall contain the same number of 16-bit PCM samples, Npcm, where: 120 <= Npcm <= 200.	T	IPVM	
439	3.2.2.1. 1.2.1 d)	DSB-AM PCM Voice Reception	The last PCM voice packet in a voice reception sent to the RIU shall contain less than or equal to Npcm linear PCM samples.	T	IPVM	
440	3.2.2.1. 1.2.1 e)	DSB-AM PCM Voice Reception	For N=1 and N=2, the MDR receiver shall complete transmission of the HDLC end FLAG for the Nth PCM message in a downlink DSB-AM voice reception no later than 0.0075 + [(N+1) * Tvf] seconds after squelch break, where: N = PCM message number since squelch break; N = 1,2,3… Tvf = K / 8,000 seconds, and K = number of PCM samples in the Nth PCM message (LEN field / 16).	T	IPVM	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
441	3.2.2.1. 1.2.1 f)	DSB-AM PCM Voice Reception	For N>2, the MDR receiver shall complete transmission of the HDLC end FLAG for the Nth PCM message in a downlink DSB-AM voice reception no later than 0.0075 + [(N-2) * Tvf] seconds after the HDLC end Flag for the 2nd PCM message (N=2) has been transmitted over the T1 link, where: N = PCM message number since squelch break; N = 3,4,5… Tvf = K / 8,000 seconds, and K = number of PCM samples in the Nth PCM message (LEN field / 16).	T	IPVM	
442	3.2.2.1. 1.2.1 g)	DSB-AM PCM Voice Reception	In DSB-AM, the N1 parameter for non-PCM messages shall not exceed 512 bits.	T	IPVM	
443	3.2.2.1. 1.2.1 h)	DSB-AM PCM Voice Reception	In DSB-AM, the N1 parameter for PCM messages shall be less than or equal to 3,264 bits.	T	IPVM	
444	3.2.2.1. 8 b)	Receiver Frequency Tolerance - VDL Mode 3 and DSB-AM	The reference used to generate the receiver operating frequency shall have a tuning adjustment adequate to compensate for the operational life of the equipment.	A	ALOF	
446	3.2.2.1. 8 c)	Receiver Frequency Tolerance - VDL Mode 3 and DSB-AM	The receiver operating frequency shall be adjustable to within +/- 1 ppm of the tuned channel center frequency.	A	ALOF	
447	3.2.2.2. 1.2.1 a)	DSB-AM PCM Voice Transmission	The transmit MDR shall perform DSB-AM modulation on the linear Pulse Code Modulation (PCM) sample stream provided by the RIU at a sampling rate of 8,000 16-bit PCM samples per second.	T	IPVM	
448	3.2.2.2. 1.2.1 b)	DSB-AM PCM Voice Transmission	At the start of a new uplink PCM voice transmission that requires more than one PCM message (EOM field = 0 in first PCM message), the transmit MDR shall begin DSB-AM voice modulation between 0 and 9 milliseconds after the receipt of the second complete PCM message in the voice transmission from the RIU.	T	IPVM	
449	3.2.2.2. 1.2.1 c)	DSB-AM PCM Voice Transmission	If the entire voice transmission requires less than two PCM messages (EOM field = 1 in first PCM message), the MDR shall begin DSB-AM voice modulation no later than 9 milliseconds after the receipt of the PCM message HDLC end FLAG from the RIU.	T	IPVM	
450	3.2.2.2. 1.2.1 d)	DSB-AM PCM Voice Transmission	After an uplink PCM DSB-AM uplink voice transmission has begun, the MDR shall continuously modulate DSB-AM voice, while the HDLC end FLAG for each PCM message is received from the RIU at least 7.5 milliseconds prior to the time when the first PCM sample in the PCM message is required to be modulated	T	IPVM	
452	3.2.3. 2 c)	Control Parameter Adjustments	The MDR receiver and transmitter shall set parameters to within the tolerance of the associated monitoring parameter (i.e., same Parameter ID).	D	DMCP	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
454	3.2.3. 2. 1 a)	Log-In (ID=1)	The log-in/log-out parameter shall: 1) Allow the log-in through the MDT/RIU and allow the MDT/RIU initiated log-out as per Section 3.2.3.2.g. 2) Include a date/time field, the user identifier, the user terminal identifier, and the security token. 3) Be applicable to MDR receivers and MDR transmitters 4) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502.	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
455	3.2.3. 2. 2 a)	Current Frequency (ID=2)	The current frequency control parameter shall: 1) Set the desired frequency of the MDR receiver or MDR transmitter as per Section 3.2.1.1.1 2) Be a set of multiple discrete frequency values 3) Have a minimum value of 112.00000 MHz 4) Have a maximum value of 136.97500 MHz 5) Have a step value of 8 1/3 kHz 6) Have a default value of the last tuned frequency on Restore, 118.00000 MHz on Initialization 7) Be applicable to the MDR receiver and MDR transmitters 8) Have a message/bit format that complies with the MDR/RIU ICD (NAS-IC-41033502)	D/T	DMCP/DSTU/IMCP	DMCP/DSTU by Test Method "D"; IMPO by Test Method "T"
456	3.2.3. 2. 3 a)	Lowest Tunable Frequency (ID=3)	The lowest tunable frequency parameter shall: 1) Set the lowest tunable frequency of the MDR receiver or MDR transmitter as per Section 3.2.1.1.1b 2) Be a set of multiple discrete frequency values 3) Have a minimum value of 112.00000 MHz 4) Have a maximum value of 118.00000 MHz 5) Have a step value of 25 kHz 6) Have a default value of 118.00000 MHz 7) Be applicable to the MDR receiver and MDR transmitters 8) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/DSTU/IMCP	DMCP/DSTU by Test Method "D"; IMPO by Test Method "T"
457	3.2.3. 2. 4 a)	Mode of Operation (ID=4)	The mode of operation parameter shall: 1) Set the MDR receiver or MDR transmitter in the 25 kHz DSB-AM, 8 1/3 kHz DSB-AM, or VDL Mode 3 modes as per Section 3.2.1.1 2) Be a set of three discrete values: 25kHz DSB-AM, 8 1/3 kHz DSB-AM, VDL Mode 3 3) Have a default value of 25 kHz DSB-AM mode 4) Be applicable to the MDR receiver and MDR transmitters 5) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/DSTU/IMCP	DMCP/DSTU by Test Method "D"; IMPO by Test Method "T"

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
458	3.2.3. 2. 5 a)	MDR State (ID=5)	The MDR state parameter shall: 1) Instruct the MDR receiver or MDR transmitter to alter its operational state as per Section 3.2.1.5 2) Be one of three discrete values representing the states (Power Down (if exercised), Online, Offline) 3) Have a default value of Offline 4) Be applicable to the MDR receiver and MDR transmitters 5) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
459	3.2.3. 2. 6 a)	Threshold Setting (ID=6)	The threshold setting parameter shall: 1) Provide new alert and alarm threshold values for the various monitoring parameters, including the parameter ID and the new alert and alarm thresholds as per Section 3.2.3.4 2) Contain thresholds for low Alarm, high Alarm, low Alert, high Alert (as applicable) of variable type with values anywhere in the range of the parameter values specified in Table 3-4 3) Have a default value (of the selected parameter) as specified in Table 3-4 4) Be applicable to the MDR receiver and MDR transmitters 5) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
460	3.2.3. 2. 7 a)	Time (ID=7)	The time parameter shall: 1) Set the time of the clock in the MDR receiver or MDR transmitter used for time stamping log entries as per Section 3.2.3.6. 2) Be in the time format of MM/DD/YYYY/HH:MM:SS.SS 3) Have a default value of 01/01/2000/00:00:00.00 4) Be applicable to the MDR receiver and MDR transmitters 5) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
461	3.2.3. 2. 8 a)	Squelch RF Threshold Level Setting (AM) (ID=8)	The squelch RF threshold level setting (AM) parameter shall: 1) Set the RF power squelch threshold for the DSB-AM modes as per Section 3.2.2.1.16 2) Be a discrete setting 3) Have a minimum value of 0 4) Have a maximum value of 63 5) Have a step value of 1 6) Have a default value of 3 7) Correlate settings of 0 to 63 to denote RF input power levels in the range of –102 dBm to –50 dBm, with setting of 0 correlating to RF input power level of –102 dBm, and setting of 63 correlating to RF input power level of –50 dBm 8) Be applicable to the MDR receiver 9) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"

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462	3.2.3. 2.10 a)	Audio Output Level (AM) (ID=10)	The receiver audio output level (AM) parameter shall: 1) Set the desired audio output level on the main audio output of the MDR receiver to support Section 3.2.2.1.9 2) Be a power level in dBm 3) Have a minimum value of -25 dBm 4) Have a maximum value of 20 dBm 5) Have a step value of 0.5 dB 6) Have a default value of –8 dBm 7) Be applicable to the MDR receiver 8) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
463	3.2.3. 2.11 a)	Receiver Mute (AM) (ID=11)	The receiver mute (AM) parameter shall: 1) Mute or unmute the MDR receiver for the DSB-AM modes as per Section 3.2.2.1.12.2 2) Be a set of two discrete values: Muted or Unmuted 3) Have a default value of Unmuted 4) Be applicable to the MDR receiver 5) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
464	3.2.3. 2.12 a)	Power Output (AM) (ID=12)	The output power parameter shall: 1) Set the MDR transmitter RF output power (CW) as per Section 3.2.2.2.5.2 2) Be an RF power level in dBm 3) Have a minimum value for the 15 watt MDR transmitter configuration of 33 dBm 4) Have a minimum value for the 50 watt MDR transmitter configuration of 40 dBm 5) Have a minimum value of 33 dBm if a single MDR transmitter enclosure is used for both 15 and 50W requirements. 6) Have a maximum value for the 15 watt MDR transmitter configuration of 42 dBm 7) Have a maximum value for the 50 watt MDR transmitter configuration of 47 dBm 8) Have a maximum value of 47 dBm if a single MDR transmitter enclosure is used for both 15 and 50W requirements. 9) Have a resolution (step size) of 0.5 dB for the all transmitter configurations 10) RESERVED 11) Have a default value for the 15 watt MDR transmitter configuration of 33 dBm 12) Have a default value for the 50 watt MDR transmitter configuration of 40 dBm 13) Have a default value of 33 dBm if a single MDR transmitter enclosure is used for both 15W and 50W requirements. 14) Be applicable to the MDR transmitters 15) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/DMPO/IMCP	DMCP/DMPO by Test Method "D"; IMPO by Test Method "T"

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465	3.2.3. 2.13 a)	Transmission Modulation % (AM) (ID=13)	The transmission modulation % (AM) parameter shall: 1) Set the MDR transmitter modulation percentage for the DSB-AM modes as per Section 3.2.2.2.4 2) Be in percent of modulation 3) Have a minimum value of 0 percent 4) Have a maximum value of 100 percent 5) Have a step value of 1 percent 6) Have a default value of 90 percent 7) Be applicable to the MDR transmitters 8) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
466	3.2.3. 2.14 a)	ATR Switch State (ID=14)	The ATR switch state parameter shall: 1) Configure the connection to the antenna for the ATR switch when in the Static mode 2) Be two discrete values: ATR1 or ATR2 3) Have a default value of: ATR2 4) Be applicable to the MDR transmitters 5) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
467	3.2.3. 2.15 a)	Switch Software Version (ID=15)	The switch software version parameter shall: 1) Indicate to the MDR receiver or the MDR transmitter to reboot to the alternate stored software image indicated in support of Section 3.2.1.4 2) Cause the MDR to transition to the Power Up state and begin operation using the alternate software image (and initiate Power Up sequence) after two Switch Software Version control parameters are received within 1 second. 3) Only be accepted when in the Offline state 4) Be one value: Switch Software Version 5) Be applicable to the MDR receiver and MDR transmitters 6) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
468	3.2.3. 2.16 a)	N1 (Number of Information Bits) (ID=16)	The N1 parameter shall: 1) Set the value of the number of bits in the information fields as defined in Section 3.2.1.6.3a 2) Be in Number of Bits 3) Have a minimum value of 128 bits 4) Have a maximum value of 4096 bits 5) Have a step value of 8 bits 6) Have a default value of 512 7) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"

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469	3.2.3. 2.17 a)	T1 (Link Response Timer) (ID=17)	The T1 parameter shall: 1) Set the link response timer as defined in Section 3.2.1.6.3b 2) Be in milliseconds 3) Have a minimum value of 100 milliseconds 4) Have a maximum value of 500 milliseconds 5) Have a step value of 1 millisecond 6) Have a default value of 200 milliseconds 7) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
470	3.2.3. 2.18 a)	T3 (Reassembly Timer) (ID=18)	The T3 parameter shall: 1) Set the reassembly timer as defined in Section 3.2.1.6.3d 2) Be in milliseconds 3) Have a minimum value of 50 milliseconds 4) Have a maximum value of 65,535 milliseconds 5) Have a step value of 1 millisecond 6) Have a default value of 250 milliseconds 7) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
471	3.2.3. 2.19 a)	HDLC Channel Number (ID=19)	The HDLC channel number parameter shall: 1) Set the HDLC channel for the MDR receiver or MDR transmitter to use to communicate with the RIU (for DACS operation where many MDRs are collocated), as per Section 3.2.1.7.1 2) Be a range of 5 values 3) Have a minimum value of 1 4) Have a maximum value of 5 5) Have a step value of 1 6) Have a default value of 1 7) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
472	3.2.3. 2.20 a)	Transmission Timeout (AM) (ID=20)	The transmission timeout (AM) parameter shall: 1) Set the MDR transmitter timeout value or disable the timeout timer as per Section 3.2.2.2.2.2 2) Be in seconds 3) Have a minimum value of 0 seconds (disabled) 4) Have a maximum value of 300 seconds 5) Have a step value of 5 seconds 6) Have a default value of 35 seconds 7) Be applicable to the MDR transmitter 8) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/DMTT/IMCP	DMCP/DMPO by Test Method "D"; IMPO by Test Method "T"

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473	3.2.3. 2.21 a)	Squelch Enable/Disable (ID=21)	The squelch enable/disable parameter shall: 1) Set whether the squelch function of the MDR receiver (Section 3.2.2.1.16) is active or not 2) Be two discrete settings: ENABLE or DISABLE 3) Have a default value of ENABLE 4) Be applicable to the MDR receiver 5) Have a format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
474	3.2.3. 2.22 a)	Request Read Back (ID=30)	The request read back parameter shall: 1) Cause the MDR receiver or MDR transmitter to reply with a radio monitoring message containing the desired monitoring parameter indicated in the Monitoring Parameter ID field, to support Section 3.2.3.3c) and 3.2.3.8 2) Contain five fields: Monitoring parameter ID, Iterations, Interval, Filter, and Data 3) Be applicable to the MDR receiver and MDR transmitters 4) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
475	3.2.3. 2.23 a)	Audio Input Level (AM) (ID=31)	The audio input level (AM) parameter shall: 1) Set the audio input level expected at the main audio output of the MDR transmitter used to set the audio input gain, as per Section 3.2.2.2.4.2 2) Be power in dBm 3) Have a minimum value of –25 dBm 4) Have a maximum value of +20 dBm 5) Have a step value of 0.5 dB 6) Have a default value of –8 dBm 7) Be applicable to the MDR transmitter 8) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
476	3.2.3. 2.26 a)	MAC Timing Offset Correction (VDL Mode 3) (ID=34)	The MAC timing offset correction (VDL Mode 3) parameter shall: 1) Indicate the relative time correction, in microseconds, that should be applied to all MDR M-burst and V/D-burst operations, relative to the previous perceived MAC 6-second epoch in the MDR, which is derived from the receiver T1 framing and Timing Channel from the RIU in support of Section 3.2.1.7.2e and 3.2.1.7.2g 2) Be timed in microseconds 3) Have a minimum value of -32768 microseconds 4) Have a maximum value of 32767 microseconds 5) Have a step value of 1 microsecond 6) Have a default value of 0 microseconds 7) Be applicable to the MDR receivers and MDR transmitters 8) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"

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477	3.2.3. 2.27 a)	Suppress Alert/Alarm (ID=35)	The suppress alert/alarm parameter shall: 1) Cause the MDR receiver and MDR transmitter to cease or resume transmitting alert and alarm messages to the MDT or RIU as per Section 3.2.3.3.2 2) Be two discrete values: Suppress or Normal 3) Have a default value of Normal 4) Be applicable to the MDR receiver and MDR transmitters 5) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
478	3.2.3. 2.28 a)	Reset (ID=36)	The reset parameter shall: 1) Have two values: Warm Reset and Factory Reset 2) Restore all control parameters to their default value and cause the MDR to clear the link and then transition to the Power Up state (and initiate Power Up sequence) after two Reset (Factory Reset) control parameters are received within 1 second. 3) Cause the MDR to clear the link and then to transition to the Power Up state (and initiate Power Up sequence) after two Reset (Warm Reset) control parameters are received within 1 second. 4) Be applicable to the MDR receiver and MDR transmitters 5) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
479	3.2.3. 2.29 a)	Software Upload Enable/Disable (ID=37)	The software upload enable/disable parameter shall: 1) Enable the MDR receiver or MDR transmitter to upload operational software to support the programmability requirements of Sections 3.2.1.4 and 3.2.3.9.3.1 2) Have two discrete values: Enable Upload and Disable Upload 3) Have a default value of Disable Upload 4) Be applicable to the MDR receiver and MDR transmitters 5) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
480	3.2.3. 2.30 a)	Software Upload (ID=38)	The software upload parameter shall: 1) Communicate blocks of the new operational software executable image to reprogram the MDR to support the programmability requirements of Sections 3.2.1.4 and 3.2.3.9.3.1. 2) Be ignored unless the Software Upload Enable/Disable parameter indicates that an upload is enabled 3) Not include the Binary Data in the Control reply message 4) Have Three Fields: Block Number, Total Blocks, Program Binary Block (variable length) 5) Be applicable to the MDR receiver and MDR transmitters 6) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"

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481	3.2.3. 2.31 a)	Receiver Mute Level (ID=39)	The receiver mute level parameter shall: 1) Set the level of attenuation associated with muting a MDR receiver as per Sections 3.2.2.1.12.2c and 3.2.2.1.12.2e 2) Be three discrete settings: -15dB, -20dB, No Audio 3) Have a default value of: “No Audio” 4) Be applicable to the MDR receiver 5) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
482	3.2.3. 2.32 a)	Test PTT (ID=40)	The Test PTT parameter shall: 1) Key the MDR transmitter continuously while set to “TEST_KEYED” similar to Section 3.2.2.2.12.2 2) Be two discrete settings: “TEST_KEYED” or “NOT_TEST_KEYED” 3) Have a default value of “NOT_TEST_KEYED” 4) Be applicable to the MDR transmitter 5) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
485	3.2.3. 5. 1 a)	Event Log (ID=1)	The Event log parameter shall: 1) Indicate events logged by the MDR in the Event Log that match the event criteria as requested and specified by the RIU or MDT 2) Include the following fields: Date/Time, MDR ID, Event Log Message ID, Number of Log Entries, and Log Entries 3) Have an alert value whenever a Log-In or Log-Out event occurs 4) Be applicable to the MDR receiver and MDR transmitters 5) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
486	3.2.3. 5. 2 a)	Current Frequency (ID=2)	The current frequency parameter shall: 1) Indicate the current frequency to which the MDR receiver or MDR transmitter is tuned as per Section 3.2.1.1.1 2) Be a frequency readout 3) Have a minimum value of 112.00000 MHz 4) Have a maximum value of 136.97500 MHz 5) Have a resolution (step size) of 8 1/3 kHz 6) Be applicable to the MDR receiver and MDR transmitters 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/DSTU/IMMP	DMMR/DSTU by Test Method "D"; IMMP by Test Method "T"

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487	3.2.3. 5. 3 a)	Lowest Tunable Frequency (ID=3)	The lowest tunable frequency parameter shall: 1) Indicate the channel label for the minimum frequency that the MDR receiver or MDR transmitter can be tuned as per Section 3.2.1.1.1b 2) Be multiple discrete frequency values 3) Have a minimum value of 112.00000 MHz 4) Have a maximum value of 118.00000 MHz 5) Have a resolution (step size) of 25 kHz 6) Be applicable to the MDR receiver and MDR transmitters 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/DSTU/IMMP	DMMR/DSTU by Test Method "D"; IMMP by Test Method "T"
488	3.2.3. 5. 4 a)	Mode of Operation (ID=4)	The mode of operation (also called system mode) parameter shall: 1) Indicate the mode of operation for the MDR receiver or MDR transmitter as per Section 3.2.1.1 2) Be one of 3 values representing the modes: 25 kHz DSB-AM, 8.33 kHz DSB-AM, or VDL Mode 3 modes 3) Be applicable to the MDR receiver and MDR transmitters 4) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/DSTU/IMMP	DMMR/DSTU by Test Method "D"; IMMP by Test Method "T"
489	3.2.3. 5. 5 a)	MDR State (ID=5)	The MDR state parameter shall: 1) Indicate the MDR receiver or MDR transmitter is in one of six states as per Section 3.2.1.5 2) Be one of 6 discrete values: Offline, Online, Power Up, Power Down (if exercised), Recovery, or Fail 3) Have an alarm value if transition to Fail state 4) Have an alert value for other state transitions 5) Be applicable to the MDR receiver and MDR transmitters 6) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
490	3.2.3. 5. 6 a)	Threshold Setting (ID=6)	The parameter threshold value parameter shall: 1) Indicate the threshold settings for the MDR transmitter or MDR receiver parameters as per Section 3.2.3.4 2) Be one of variable values 3) Be applicable to the MDR receiver and MDR transmitters 4) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"

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491	3.2.3. 5. 7 a)	Time (ID=7)	The time readback parameter shall: 1) Indicate the current time within the MDR receiver or MDR transmitter to support Section 3.2.3.6 2) Be in a format of MM/DD/YYYY HH:MM:SS.SS 3) Have a resolution (step size) of 0.01 second 4) Have a tolerance (acceptable error) of +/-0.1 second 5) Reserved 6) Be applicable to the MDR receiver and MDR transmitters 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
492	3.2.3. 5. 8 a)	Squelch RF Threshold Level Setting (AM) (ID=8)	The squelch RF threshold level setting parameter shall: 1) Indicate the RF power settings needed to break the DSB-AM squelch of the MDR receiver as per 3.2.2.1.16 2) Be discrete values 3) Have a minimum value of 0 4) Have a maximum value of 63 5) Have a resolution (step size) of 1 6) Be applicable to the MDR receiver 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
493	3.2.3. 5.10 a)	Audio Output Level Setting (AM) (ID=10)	The audio output level setting (AM) parameter shall: 1) Indicate the setting of the audio output level parameter of the MDR receiver as per Section 3.2.2.1.9 2) Be power in dBm 3) Have a minimum value of –25 dBm 4) Have a maximum value of 20 dBm 5) Have a resolution (step size) of 0.5 dB 6) Be applicable to the MDR receiver 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
494	3.2.3. 5.11 a)	Receiver Mute (AM) (ID=11)	The receiver mute (AM) parameter shall: 1) Indicate whenever the MDR receiver is muted or unmuted for DSB-AM as per Section 3.2.2.1.12.2 5) Be one of 2 values: Muted or Unmuted 6) Be applicable to the MDR receiver 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"

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495	3.2.3. 5.12 a)	Power Output Setting (AM) (ID=12)	The power output setting parameter shall: 1) Indicate the setting of the Power Output parameter of the MDR transmitter as per Section 3.2.2.2.5.2 2) Be a power level in dBm 3) Have a minimum value for the 15 watt MDR transmitter configuration of 33 dBm 4) Have a minimum value for the 50 watt MDR transmitter configuration of 40 dBm 5) Have a minimum value of 33 dBm if a single MDR transmitter enclosure is used for both 15W and 50W requirements 6) Have a maximum value for the 15 watt MDR transmitter configuration of 42 dBm 7) Have a maximum value for the 50 watt MDR transmitter configuration of 47 dBm 8) Have a maximum value of 47 dBm if a single MDR transmitter enclosure is used for both 15W and 50W requirements. 9) Have a resolution (step size) of 0.5 dB for all transmitter configurations 10) Reserved 11) Be applicable to the MDR transmitters 12) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/DMPO/IMMP	DMMR/DMPO by Test Method "D"; IMMP by Test Method "T"
497	3.2.3. 5.13 a)	Transmitter Modulation % Setting (AM) (ID=13)	The transmitter modulation % setting parameter shall: 1) Indicate the setting of the Transmitter modulation % parameter of MDR transmitter as described in Section 3.2.2.2.4 2) Be in percent 3) Have a minimum value of 0 percent 4) Have a maximum value of 100 percent 5) Have at least 100 steps 6) Have a tolerance (acceptable error) of +/-5 percent 7) Be applicable to the MDR transmitters 8) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
498	3.2.3. 5.14 a)	ATR Switch State (ID=14)	The ATR switch state parameter shall: 1) Indicate the state of the ATR switch to the antenna 2) Be one of two discrete values: ATR1 or ATR2 3) Reserved 4) Be applicable to the MDR transmitters 5) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"

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499	3.2.3. 5.15 a)	Software Version (ID=15)	The software version parameter shall: 1) Indicate the current version of the software active in the MDR receiver or MDR transmitter, as well as the version number of the standby software version, to support the programmability requirements of Section 3.2.1.4 2) Be one of 255 discrete values for each field 3) Have a minimum value of 1 4) Have a maximum value of 255 5) Use a value of 0 to indicate an invalid or non-existent version 6) Have a resolution (step size) of 1 7) Have a tolerance (acceptable error) of 0 8) Be applicable to the MDR receiver and MDR transmitters 9) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
500	3.2.3. 5.16 a)	N1 (Number of Information Bits) (ID=16)	The N1 parameter shall: 1) Indicate the value of the number of bits in the information fields as described in Section 3.2.1.6.3a 2) Be the value in bits 3) Have a minimum value of 128 4) Have a maximum value of 4096 5) Have a resolution (step size) of 8 6) Be applicable to the MDR receiver and MDR transmitters 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
501	3.2.3. 5.17 a)	T1 (Link Response Timer) (ID=17)	The T1 parameter shall: 1) Indicate the link response time as described in Section 3.2.1.6.3b 2) Be a value in milliseconds 3) Have a minimum value of 100 milliseconds 4) Have a maximum value of 500 milliseconds 5) Have a resolution (step size) of 1 millisecond 6) Be applicable to the MDR receiver and MDR transmitters 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
502	3.2.3. 5.18 a)	T3 (Reassembly Timer) (ID=18)	The T3 reassembly timer parameter shall: 1) Indicate the time value of the T3 reassembly timer as described in Section 3.2.1.6.3d 2) Be a value in milliseconds 3) Have a minimum value of 50 milliseconds 4) Have a maximum value of 65,535 milliseconds 5) Have a resolution (step size) of 1 millisecond 6) Be applicable to the MDR receiver and MDR transmitters 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
503	3.2.3. 5.19 a)	HDLC Channel Number (ID=19)	The HDLC channel number parameter shall: 1) Indicate the HDLC channel for the MDR receiver or MDR transmitter to use to communicate with the RIU (for DACS operation where many MDRs are collocated) as per Section 3.2.1.7.1 2) Be a range of 5 values 3) Have a minimum value of 1 4) Have a maximum value of 5 5) Have a resolution (step size) of 1 6) Be applicable to the MDR receiver and MDR transmitters 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
504	3.2.3. 5.20 a)	Transmission Time-Out Value (ID=20)	The transmission time-out value (AM) parameter shall: 1) Indicate the current time-out value after which the voice transmission will be terminated by the MDR transmitter as per Section 3.2.2.2.2.2 2) Be time in seconds 3) Have a minimum value of 0 seconds 4) Have a maximum value of 300 seconds 5) Have a resolution (step size) of 5 seconds 6) Have a tolerance (acceptable error) 0.5 second 7) Be applicable to the MDR transmitters 8) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/DMTT/IMMP	DMMR/DMTT by Test Method "D"; IMMP by Test Method "T"
505	3.2.3. 5.21 a)	Squelch Enable/Disable (AM) (ID=21)	The squelch enable/disable parameter shall: 1) Indicate the squelch break function (Section 3.2.2.1.16) has either activated or deactivated for the DSB-AM modes in the MDR receiver 2) Be two discrete values: ENABLE or DISABLE 3) Be applicable to the MDR receiver 4) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
506	3.2.3. 5.30 a)	MDR ID Number (ID=50)	The MDR ID number parameter shall: 1) Indicate the unique identification number assigned to the MDR receiver or MDR transmitter 2) Be discrete numerical values 3) Have a minimum value of 1 4) Have a maximum value 16,777,215 5) Have a resolution (step size) of 1 6) Be applicable to the MDR receiver and MDR transmitters 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"

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507	3.2.3. 5.31 a)	RF Input Power Level (AM) (ID=51)	The RF input power level parameter shall: 1) Indicate an estimate of the received signal level present at the MDR RF input to support Section 3.2.2.1.21 2) Be power values in dBm 3) Have a minimum value of –110 dBm 4) Have a maximum value of 15 dBm 5) Have a resolution (step size) 1 dB 6) Have a tolerance (acceptable error) of +/-3 dB 7) Have an alert value of greater than –7 dBm 8) Have an alarm value of greater than +13 dBm 9) Be applicable to the MDR receiver 10) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
508	3.2.3. 5.32 a)	Squelch Break Status (AM) (ID=52)	The squelch break status (AM) parameter shall: 1) Indicate whenever the MDR receiver determines a valid transmission is being received as per Section 3.2.2.1.16 2) For DSB-AM operation, this is achieved by the RF signal exceeding the squelch thresholds 3) Be two discrete values: Squelch Broken or Not Broken 4) Be applicable to the MDR receiver 5) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
509	3.2.3. 5.33 a)	In-Service Time (ID=53)	The in-service time parameter shall: 1) Indicate the number of hours the MDR receiver or MDR transmitter have been continuously powered to support Section 3.5.1.1 2) Be provided in hours 3) Have a minimum value of 0 hours 4) Have a maximum value of 2e24-1 hours 5) Have a resolution (step size) of 1 hour 6) Have a tolerance (acceptable error) of +/-1 hour 7) Be applicable to the MDR receiver and MDR transmitters 8) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
510	3.2.3. 5.34 a)	RIU Timing Offset Change (VDL Mode 3) (ID=54)	The RIU timing offset change (VDL Mode 3) parameter shall: 1) Indicate whenever the RIU's timing reference varies more than 10 microseconds for the MDR receiver or MDR transmitter as per Section 3.2.1.7.2g 2) Be two discrete values: Yes (there is a time slip) or No (there is no time slip) 3) Have an alert value to Alert on time slip 4) Be applicable to the MDR receiver and MDR transmitters 5) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
511	3.2.3. 5.35 a)	Transmit Antenna VSWR (ID=55)	The transmit antenna VSWR parameter shall: 1) Indicate whether the VSWR of the transmit antenna path is acceptable as per Section 3.2.2.2.5 2) Be one of two discrete values: Good or Bad 3) Have an alarm value of Bad, defined as when the VSWR equals or exceeds 3:1. 4) Be applicable to the MDR transmitters 5) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
513	3.2.3. 9.1 a)	Verification	The MDR shall verify the authenticity, integrity and time validity of the digital signed information received via the MDT or RIU interfaces.	A	ASSC	
514	3.2.3. 9.1 b)	Verification	The digital signature algorithm that performs this verification shall correspond to at least one of the algorithms defined in FIPS 186-2.	A	ASSC	
515	3.2.3. 9.1 c)	Verification	The digital signature function shall meet or exceed security level 1 as defined in FIPS 140-1.	A	ASSC	
516	3.2.3. 9.1 d)	Verification	The digital signature function shall be validated according to FIPS 140-1 by an accredited FIPS 140-1 testing laboratory.	A	ASSC	
517	3.2.3. 9.2 a)	Keys	The MDR shall provide storage for at least 10 public key certificates, any of which may be used in verifying the digital signature defined in 3.2.3.9.1.	D	DMDS	
518	3.2.3. 9.2 b)	Keys	The storage for public keys shall be in non-volatile memory and be maintained through power loss and restoral.	D	DMDS	
519	3.2.3. 9.2 c)	Keys	The MDR shall provide a mechanism to add and delete public keys via the MDT or RIU interface.	D	DMDS	RIU not verified in this test case
520	3.2.3. 9.3 a)	Security Procedures	All control parameter commands, except ID#30 Request Readback, shall be accepted only if the requesting device provides a valid digitally signed authorization token (“security token”).	D	DMDS	
521	3.2.3. 9.3 c)	Security Procedures	The MDR shall receive and authenticate the security token each time an RIU or MDT logs in.	D	DMDS	RIU not verified in this test case
522	3.2.3. 9.3.1 a)	Software Upload Security	Software uploads that are not digitally signed or contain an invalid digital signature shall be rejected.	D	DMDS	
523	3.2.3. 9.3 b)	Security Procedures	All control parameter commands, except ID#30 Request Readback, received without establishment of, or outside of, a Control session, or are associated with a security token that fails digital signature verification, shall be rejected.	D	DMDS	
526	3.2.3. 9.3.2 b)	Control Session	As long as a valid session is active on one control interface, the MDR shall reject all control parameters from the other control interface.	T	IMCP	
527	3.2.3. 9.3.2 c)	Control Session	The MDR shall terminate the control session upon log-out, MDT disconnection or after no control parameters is received within 30 minutes.	D	DMDS	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
528	3.2.3. 9.4 a)	Boot Cycle	The MDR boot cycle or equivalent shall be secured such that the possibility of an illegitimate reconfiguration of the MDR operating software during the boot cycle or equivalent is extremely low.	A	ASSC	
529	3.3.2.2 b)	RIU Connector	The MDR receiver and transmitter shall receive epoch timing from the timing channel and voice/data/signaling communications from the HDLC data channel per NAS-IC-41033502.	T	ISTC	
530	3.4.1.2.5 b)	Front Panel Display	The MDR receiver and transmitter visual indicators shall provide visual indications on the front panel as follows: 1) A red indicator that is lit in the event of a failure or when the MDR is in Failed state. 2) A yellow indicator that is lit in the event of an alert, and flashes in the event of an alarm. 3) A green indicator that is lit when the MDR is in Offline or Online state, and flashes when the MDR is in Recovery state.	D	DMAP	
531	3.4.1.2.5 c)	Front Panel Display	The visual indications for failure events, alarm events and alert events shall remain until the failure, alarm or alert is cleared by the respective Return to Normal.	D	DMAP	
532	3.2.3. 2.33 a)	Public Key Maintenance (ID=41)	The Public Key Maintenance parameter shall: 1) Allow the MDT/RIU to add or delete MDR-stored public keys as per Section 3.2.3.9.2c 2) Have six fields: Time/Date, User, User Terminal, Add/Subtract Indicator, Key ID, Key, Security Token 3) Be applicable to the MDR receiver and MDR transmitter 4) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
533	3.2.1.5 a)	MDR State and State Transition Requirements	The MDR shall have the following states: Off, Power Up, Offline, Online, Recovery, Failed and Power Down (if exercised), as defined in Section 6.2.15.	D	DSST	
534	3.2.1.5 b)	MDR State and State Transition Requirements	The MDR shall provide visual indication of the MDR state on the MDR front panel.	D	DSST	
536	3.2.1.5.1 a)	State Transition	The MDR shall transition from state to state in accordance with Section 6, Table 6-1, and Figure 6-2, as applicable.	D	DSST	
537	3.2.1.5.2 a)	Off State	When in the OFF state, the MDR transmitter shall not transmit.	D	DSST	
538	3.2.1.5.2 b)	Off State	When in the OFF state, the MDR receiver shall not generate any form of audio output.	D	DSST	
539	3.2.1.5.2 c)	Off State	When AC or DC power is present at the MDR power input, (i.e. not in the Off state), the MDR shall provide visual indication of power.	D	DSST	
540	3.2.1.5.3 a) 1)	Power Up State	When in the Power Up State 1) The MDR transmitter shall not transmit.	D	DSST	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
541	3.2.1.5.3 a) 2)	Power Up State	When in the Power Up State 2) The MDR receiver shall not generate any form of audio output.	D	DSST	
542	3.2.1.5.3 b)	Power Up State	The time between application/restoral of power to the MDR and the MDR's transition out of the Power Up state shall not exceed 30 seconds.	D	DSST	
543	3.2.1.5.3 c)	Power Up State	The MDR shall conduct and complete Power On Self Test functions in the Power Up state.	D	DSST	
544	3.2.1.5.3 d)	Power Up State	If the MDR was in Online state prior to the most recent Powerdown/Off state, upon completion of the Power Up sequence, the MDR shall transition from Power Up state to Online state.	D	DSST	
545	3.2.1.5.3 e)	Power Up State	If the MDR was in Offline state prior to the most recent Powerdown/Off state, upon completion of the Power Up sequence, the MDR shall transition from Power Up state to Offline state.	D	DSST	
546	3.2.1.5.4 a)	Off Line State	When in Offline state, the remote analog audio and remote discrete Push-to Talk (PTT) input of the MDR shall be disabled.	D	DSST	
547	3.2.1.5.4 b)	Off Line State	When in Offline state, the digital, local analog audio, and local PTT inputs of the MDR transmitter shall be enabled.	D	DSST	
550	3.2.1.5.5 a)	On Line State	When in Online state, the MDR shall enable all functions, process control parameter commands in accordance with Section 3.2.3.2, and disable local user (technician) analog audio input and local user PTT input when the remote user PTT (or audio equivalent) is active.	D	DSST	
553	3.2.1.5.6 a)	Recovery State	The MDR shall enter the Recovery state when the MDR detects a potentially recoverable failure.	D	DSST	
554	3.2.1.5.6 b)	Recovery State	Potentially recoverable failures shall include, but not be limited to, over-temperature conditions and RIU timing offset slip.	D	DSST	
555	3.2.1.5.6 c)	Recovery State	When in Recovery State, the MDR transmitter shall not transmit.	D	DSST	
556	3.2.1.5.6 d)	Recovery State	When in Recovery state, the MDR receiver shall not generate any form of audio output.	D	DSST	
557	3.2.1.5.6 e)	Recovery State	The MDR shall transition from the Recovery state to the previous state if the recovery process has been successful (e.g. the recoverable fault was eliminated).	D	DSST	
558	3.2.1.5.6 f)	Recovery State	The MDR shall transition from the Recovery state to the Failed state if the recovery process was not successful (e.g. the potentially recoverable fault could not be eliminated).	D	DSST	
559	3.2.1.5.7 a) 1)	Failed State	When in Failed state, 1) the MDR transmitter shall not transmit.	D	DSST	
560	3.2.1.5.7 a) 2)	Failed State	When in Failed state, 2) the MDR receiver shall not generate any form of audio output.	D	DSST	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
561	3.2.1.5.7 a) 3)	Failed State	When in Failed state, 3) the MDR shall enable only those control commands that can be executed accurately.	D	DSST	
562	3.2.1.5.7 b)	Failed State	The MDR shall transition to the Failed state if the MDR detects an unrecoverable failure, defined as a failure that a local user (technician) cannot eliminate from outside the MDR.	D	DSST	
563	3.2.1.5.8 a) 1)	Power Down State	If the MDR employs a Power Down state, then when in Power Down state, 1) the MDR transmitter shall not transmit.	D	DSST	
564	3.2.1.5.8 a) 2)	Power Down State	If the MDR employs a Power Down state, then when in Power Down state, 2) the MDR receiver shall not generate any form of audio output.	D	DSST	
565	3.2.1.5.8 a) 3)	Power Down State	If the MDR employs a Power Down state, then when in Power Down state, 3) all MDR functions shall be disabled, except logging/reporting and front panel indication.	D	DSST	
566	3.2.1.5.8 a) 4)	Power Down State	If the MDR employs a Power Down state, then when in Power Down state, 4) the MDR shall provide visual indication on the front panel that the MDR is ready for transition to Off state.	D	DSST	
567	3.2.1.5.8 b)	Power Down State	If the Power Down state is implemented, the MDR shall accept the control parameter to transition to the Power Down State (ID#5 "MDR State" with value "Power Down") only from the MDR port.	D	DSST	
568	3.2.1.6.5.1.1 a)	Voice-Burst (V-Burst) Message	The MDR transmitter shall receive V-burst messages from the RIU (Message ID = 0), encoded as defined in NAS-IC-41033502.	T	IVBM	
571	3.2.1.4 h)	Software and Processor Requirements	If the Software upload is rejected, either by failed Cyclic Redundancy Check (CRC) or incorrect authentication, the MDR shall send a Control reply (RR=0) message containing a Software Upload Enable/Disable parameter indicating DISABLE_UPLOAD and an error code indicating the reason for rejection.	D	DMCP	
572	3.2.1.6.3 b)	Link Level Parameters	The MDR shall discard clearing TEST response frames after the expiration of the T1 timer in accordance with NAS-IC-41033502.	T	ILLI	
573	3.2.1.6.3 c)	Link Level Parameters	The MDR shall retransmit a clearing TEST command frame upon expiration of the T2 timer in accordance with NAS-IC-40233502.	T	ILLI	
574	3.2.1.6.3 d)	Link Level Parameters	The MDR shall reject Control and Monitoring message segments received after expiration of the T3 timer in accordance with NAS-IC-40233502.	T	ILLI	
575	3.2.2.1.16.1.1 a)	Receiver Squelch - VDL Mode 3	The MDR receiver shall search for appropriate burst synchronization as indicated by the information contained within the Sync Search Control message as per NAS-IC-41033502.	T	RVSN	
576	3.2.3 b)	Site Control and Monitoring	The MDR shall allow local control and monitoring by interface and interoperation with the Maintenance Data Terminal (MDT), as specified in the MDT Maintenance Application Software Requirements Specification (SRS), FAA-E-2944.	D	DMCP/DMMR	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
579	3.2.3. 2 d)	Control Parameter Adjustments	The MDR shall reply to Control request messages (RR=1 per NAS-IC-41033502) with a Control reply message (RR=0) containing the parameter setting actually enacted by the MDR.	T	IRMM	
580	3.2.3. 2 e)	Control Parameter Adjustments	Rejected Control request messages shall contain the original parameter setting with an error code indicating the reason for rejection, per NAS-IC-41033502.	T	IRMM	
581	3.2.3. 2 f)	Control Parameter Adjustments	All control parameters in Table 3-3 shall be modifiable when the MDR is in the Offline state.	D	DMCP	
582	3.2.3. 2 g)	Control Parameter Adjustments	When in the Online state, the MDR shall reject all control parameter commands except the following: 1 Log In 5 MDR State 6 Alarm/Alert Threshold Setting 8 Squelch RF Threshold Level Setting 9 Squelch Audio Signal to Noise Threshold Level Setting 11 Receiver Mute 13 Transmitter Modulation 14 ATR Switch State 20 Transition Timeout 21 Squelch Enable/Disable 30 Request Read Back 34 MAC Timing Offset Correction 35 Suppress Alarm/Alert 36 Reset 37 Software Upload Enable/Disable 38 Software Upload	D	DMCP	
583	3.2.3. 2. 9 a)	Squelch Audio Signal-to-Noise Level Setting (AM) (ID=9)	The squelch audio signal-to-noise level setting parameter shall: 1) Indicate the audio signal-to-noise ratio needed to break the DSB-AM squelch of the MDR receiver as per Section 3.2.2.1.16 2) Be discrete values 3) Have a minimum value of 0 4) Have a maximum value of 10 5) Have a resolution (step size) of 1 6) Correlate settings of 0 to 10 to denote squelch audio signal-to-noise levels in the range of +5 dB to +15 dB, with setting of 0 correlating to squelch audio signal-to-noise ratio of +5 dB, and setting of 10 correlating to squelch audio signal-to-noise ratio of +15 dB 7) Be applicable to the MDR receiver 8) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
584	3.2.3. 2.34 a)	T2 (Link Retransmission Timer) (ID=42)	The T2 parameter shall: 1) Set the link retransmission timer as defined in Section 3.2.1.6.3c 2) Be in seconds 3) Have a minimum value of 1 seconds 4) Have a maximum value of 10 seconds 5) Have a step value of 1 second 6) Have a default value of 5 seconds 7) Be applicable to both MDR transmitters and MDR receivers 8) Have a message/bit format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"
585	3.2.3. 3 b)	MDR Monitoring and Reporting	The MDR shall only support those Monitoring and Reporting functions to which it can report within specified tolerances when in the Recovery state.	D	DMMR	
586	3.2.3. 4 c)	Alarm/Alert Processing	A monitored parameter shall change state when the monitored parameter value transitions from a value within one range to a value within another range, if applicable for the parameter.	D	DMAP	
587	3.2.3. 4 e)	Alarm/Alert Processing	The MDR shall apply a discriminating function (hysteresis) at the boundaries of the ranges to minimize the declaration of alarms and alerts generated under monitored parameter transient conditions.	A	AMAP	
588	3.2.3. 4 h)	Alarm/Alert Processing	The MDR shall not generate spurious alert events in any state or transition	A	AMAP	
589	3.2.3. 4 m)	Alarm/Alert Processing	The MDR shall not generate spurious alarm events in any state or transition.	A	AMAP	
590	3.2.3. 5. 9 a)	Squelch Audio Signal-to-Noise Threshold Level Setting (AM) (ID=9)	The squelch audio signal-to-noise threshold level setting parameter shall: 1) Indicate the audio signal-to-noise ratio setting of the MDR receiver as per 3.2.2.1.16 2) Be discrete values 3) Have a minimum value of 0 4) Have a maximum value of 10 5) Have a resolution (step size) of 1 6) Be applicable to the MDR receiver 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
591	3.2.3. 5.22 a)	Audio Input Level Setting (ID=31)	The audio input level setting parameter shall: 1) Indicate the setting of the audio input level parameter as per Section 3.2.2.2.4.2 2) Be a decimal number representing dBm 3) Have a minimum value of –25 dBm 4) Have a maximum value of +20 dBm 5) Have a resolution (step size) of 0.5 dB 6) Be applicable to the MDR transmitters 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
592	3.2.3. 5.23 a)	MAC Timing Offset Level Setting (ID=34)	The MAC timing offset level setting parameter shall: 1) Indicate the setting of the MAC Timing Offset Level parameter as per Sections 3.2.1.7.2e and 3.2.1.7.2g 2) Be an integer representing microseconds 3) Have a minimum value of –32768 4) Have a maximum value of +32767 5) Have a resolution (step size) of 1 6) Be applicable to the MDR transmitters and MDR receiver 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
593	3.2.3. 5.24 a)	Suppress Alarm/Alert Setting (ID=35)	The suppress alarm/alert Setting parameter shall: 1) Indicate the setting of the Suppress Alarm/Alert parameter as per Section 3.2.3.3.2 2) Be of two discrete values, either “Suppress” or “Normal” 3) Be applicable to the MDR transmitters and MDR receiver 4) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
594	3.2.3. 5.25 a)	Software Upload Setting (ID=37)	The software upload setting parameter shall: 1) Indicate the setting of the Software Upload parameter to support the programmability requirements of Section 3.2.1.4 2) Be of two discrete values, either “Enable Upload” or “Disable Upload” 3) Be applicable to the MDR transmitters and MDR receiver 4) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
595	3.2.3. 6 a)	Logging Requirements	The MDR shall log the following events: 1) State change events, defined as the transition from one state to any other state 2) Log-in/Log-out events, defined as the receipt of control parameter ID#1, or automatic logout 3) Control events, defined as receipt of any control parameter command except ID#30, Request Readback. 4) Failure events, defined as the detection of any failure 5) Alarm/Alert/Return to Normal events, defined as a monitored parameter crossing of any active alarm or alert threshold	D	DMDR	
596	3.2.3. 6.1 a)	Automatic State Transition Log Entry	For Automatic state transitions, the MDR shall log the: 1) Event Type as Automatic State Change 2) FROM state 3) TO state and 4) Date/time (of transition).	D	DMDR	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
597	3.2.3. 5.29 a)	T2 (Link Retransmission Timer) (ID=42)	The T2 parameter shall: 1) Indicate the link retransmission time as described in Section 3.2.1.6.3c 2) Be a value in seconds 3) Have a minimum value of 1 seconds 4) Have a maximum value of 10 seconds 5) Have a resolution (step size) of 1 second 6) Be applicable to the MDR receiver and MDR transmitters 7) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
598	3.2.3. 6.2 a)	Manual State Transition Log Entry	For Manual state transitions, the MDR shall log the: 1) Event Type as Manual State Change 2) FROM state 3) TO state 4) Date/time (of transition) 5) User Identification and 6) User Terminal Identification.	D	DMDR	
599	3.2.3. 6.2 b)	Manual State Transition Log Entry	User Terminal field shall indicate the MDT identification or the Remote User Terminal identification.	D	DMDR	
600	3.2.3. 6.3 a)	Log-In/Log-Out Log Entry	For Log-in/Log-out events, the MDR shall log the: 1) Event Type as Log-in/Log-out 2) Date/Time 3) Session Action 4) User Identification 5) User Terminal identification 6) Authentication Result	D	DMDR	
601	3.2.3. 6.3 b)	Log-In/Log-Out Log Entry	The Session Action field shall indicate whether the Log-In/Log-Out Event was a Log-In, Commanded Log Out, or Automatic Log-Out.	D	DMDR	
602	3.2.3. 6.3 c)	Log-In/Log-Out Log Entry	Authentication Result field shall indicate whether the Digital Signature associated with the Log- In was authenticated or rejected.	D	DMDR	
603	3.2.3. 6.4 a)	Control Event Log Entry	For Control events, the MDR shall log the: 1) Event Type as Control 2) Control Parameter ID 3) Control Parameter BEFORE value 4) Control Parameter value except software update payload 5) Date/time (of Control command receipt) 6) User Identification 7) User Terminal identification 8) MDR Response.	D	DMDR	
604	3.2.3. 6.4 b)	Control Event Log Entry	The MDR Response field shall indicate whether the MDR accepted or rejected the control parameter command.	D	DMDR	

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605	3.2.3. 6.4 c)	Control Event Log Entry	If the MDR rejects the control parameter command, the MDR Response field shall be contain the error code.	D	DMDR	
606	3.2.3. 6.5 a)	Failure Event Log Entry	For Failure events, the MDR shall log the: 1) Event Type as Failure 2) FROM state 3) TO state (Recovery or Failed) 4) Failure code, and 5) Date/time (of Failure).	D	DMDR	
607	3.2.3. 6.5 b)	Failure Event Log Entry	The Failure code field shall contain text or numeric codes to indicate the specific failure type.	D	DMDR	
608	3.2.3. 6.6 a)	Alarm/Alert/RTN Log Entry	For Alarm/Alert/RTN events, the MDR shall log the: 1) Event Type as Alarm/Alert/RTN 2) Monitored Parameter ID 3) Monitored Parameter value, and 4) Date/time (of Alarm/Alert/RTN).	D	DMDR	
609	3.2.3. 6.6 b)	Alarm/Alert/RTN Log Entry	The Event Type field shall be coded to indicate whether the event was an Alarm, an Alert or a Return to Normal.	D	DMDR	
610	3.2.3. 6.7 a)	MDT Log Maintenance	The MDR shall log at least 1000 events, in any combination of events, and log events on a First In, First Out basis.	D	DMDR	
611	3.2.3. 6.7 b)	MDT Log Maintenance	The MDR log and log entries shall be retained while the MDR is any state, including OFF state, and through any transition, including power loss and restoral, for the life of the MDR receiver and transmitters.	D	DMDR	
612	3.2.3. 6.7 c)	MDT Log Maintenance	The MDR log entries shall be retained until over-written by a valid log entry.	D	DMDR	
613	3.2 c)	MDR Requirements	The MDR receiver and MDR transmitter shall interface to the Radio Interface Unit (RIU) as defined in NAS-IC-41033502.	LL	None	Must meet all NAS-IC-41033502
614	3.2.1.6.5.1.6 b)	Radio Control Message	The MDR shall report errors with radio control messages in accordance with NAS-IC-41033502.	T	IRCM	
615	3.3.1.1.2 a)	FILTER IN Connector	The FILTER IN connector shall be used for the input to the internal filter.	I	PCON	
616	3.3.1.1.3 a)	FILTER OUT Connector	The FILTER OUT connector shall be used for the output from the internal filter.	I	PCON	
617	3.3.1.1.4 a)	ATRC Connector	The ATRC connector shall be used for the antenna connection in the configurations based on Section 3.2.2.2.14 (see example configuration in Figure 6-1).	I	PCON	
618	3.3.1.1.5 a)	ATR1 Connector	The ATR1 connector shall be used for the remote MDR connection in the configurations based on Section 3.2.2.2.14 (see example configuration in Figure 6-1).	I	PCON	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
619	3.3.1.1.6 a)	ATR2 Connector	The ATR2 connector shall be used for the local MDR connection in the configurations based on Section 3.2.2.2.14 (see example configuration in Figure 6-1).	I	PCON	
620	3.2.2.2.14 k)	ATR Operation	In the Static Mode, the ATR shall provide connectivity between the ATRC and ATR1 or ATR2 based on the ATR Switch State (ID-14) (e.g. ATR1 (Remote) for Standby Transmitter operation and ATR2 (Local) for Main Transmitter operation).	A	AATR	
621	3.2.2.2.14 n)	ATR Operation	The ATR shall have a maximum allowable loss of 1dB.	A/T	AATR/SATR	AATR - for VDL Mode 3, SATR - for DSB-AM
623	3.2.1.2.2.4 d)	LBACs for the MDR Receiver	The MDR receiver shall declare synchronization in VDL Mode 3 when the center of the first D8PSK symbol in the matching synchronization sequence falls within the time window specified by the S_START and S_STOP fields of the Sync Search Control message.	T	ISTC	
624	3.2.1.2.2.4 e)	LBACs for the MDR Receiver	After achieving VDL Mode 3 synchronization within the time window specified in the Sync Search Control message, the MDR receiver shall demodulate and decode the number of Golay Words (24,12) Golay words (Number of Golay Words (NGW) as specified in Sync Search Control message), and demodulate all remaining D8PSK data (for Voice or Data bursts, V/D-bursts) in the received burst.	T	ISTC	
625	3.2.1.2.2.4 f)	LBACs for the MDR Receiver	After achieving VDL Mode 3 synchronization with STYPE=2 (V/D-burst), the MDR receiver shall decode the voice/data header Message ID field and report the voice/data header, Golay error count, Time of Arrival (TOA), received power level and remaining D8PSK data in the burst to the RIU using the V-burst message (if Message ID = 0-3) or D-burst message (if Message ID=3-7) in accordance with the HDLC message timing rules specified in Section 3.2.1.6.6 and the V/D-burst message formats defined in NAS-IC-41033502.	T	ISTC	
626	3.2.1.2.2.4 g)	LBACs for the MDR Receiver	After achieving VDL Mode 3 synchronization with S1, S1* or S2* (M-burst), the MDR receiver shall report the sync type (STYPE), Time of Arrival (TOA), Golay error counts, received power level and decoded Golay words to the RIU using the M-burst message in accordance with the HDLC message timing rules specified in Section 3.2.1.6.6 and the M-burst message format defined in NAS-IC-41033502.	T	ISTC	
627	3.2.1.6.5.1.1 b)	Voice-Burst (V-Burst) Message	The MDR receiver shall send V-burst messages to the RIU (Message ID = 0), encoded as defined in NAS-IC-41033502.	T	IVBM	
628	3.2.1.6.5.1.2 b)	Data-Burst (D-Burst) Message	The MDR receiver shall send D-burst messages to the RIU (Message ID = 1), encoded as defined in NAS-IC-41033502.	T	IDBM	
629	3.2.1.6.5.1.3 b)	Management-Burst (M-Burst) Message	The MDR receiver shall send M-burst messages to the RIU (Message ID = 2), encoded as defined in NAS-IC-41033502.	T	IMBM	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
630	3.2.1.6.5.1.5 b)	PCM-Voice Message	The MDR receiver shall send PCM-Voice messages to the RIU (Message ID = 4), encoded as defined in NAS-IC-41033502.	T	IPVM	
631	3.2.2.1.28.1 a)	Receiver Power Measurement - VDL Mode 3	The accuracy of the MDR receiver power measurement reported to the RIU in the V-burst message, D-burst message and M-burst message shall be +/- 3dB over the input signal range specified in Section 3.2.2.1.21.1.	A	ARPM	
632	3.2.2.1.28.1 b)	Receiver Power Measurement - VDL Mode 3	For V-burst messages and D-burst messages sent to the RIU, the Receive Power field shall indicate the average receiver power measured over a minimum interval of 40 D8PSK symbol periods.	A	ARPM	
633	3.2.2.1.28.1 c)	Receiver Power Measurement - VDL Mode 3	For M-burst messages sent to the RIU, the Receive Power field shall indicate the average receiver power measured over a minimum interval of 16 D8PSK symbol periods.	A	ARPM	
634	3.2.2.1.28.2 b)	Receiver Power Measurement - DSB-AM	For PCM messages sent to the RIU, the Receiver Power field shall indicate the average receiver power measured over the number of PCM samples reported in the PCM message (LEN/16).	A	ARPM	
635	3.2.1.6.2.1 a)	MDR Receiver Frame Priority	The MDR receiver shall give priority to the transmission of Voice and PCM Voice messages, such that they are to be the next frame transmitted upon the data being received and formatted into an HDLC frame.	A	AVPM	
636	3.2.1.6.2.1 b)	MDR Receiver Frame Priority	The MDR receiver shall give priority to the transmission of Management and Data messages over Monitoring and Control response messages.	A	AVPM	
637	3.2.1.6.7 a)	MDR Transmitter Received HDLC Message Timing	The MDR manufacturer shall specify message timing parameters Tm1 through Tm5 as defined in the Table 3-1C below:	T	ITHT	See Table 3-1C
638	3.2.1.6.7 b)	MDR Transmitter Received HDLC Message Timing	Message timing parameters Tm1 through Tm5 shall not exceed the absolute maximum values shown in the Table defined in Section 3.2.1.6.7a.	T	ITHT	See Table 3-1C
639	3.2.1.6.7 c)	MDR Transmitter Received HDLC Message Timing	When the MDR is in the Online state in VDL Mode 3 and a V-burst message, D-burst message or M-burst message is received from the RIU in accordance with timing parameters Tm1-Tm5, the MDR shall begin D8PSK modulation of the burst ramp-up at time: [[[TOT/16]-5.5]/10,5000]+/- 11.9*1E-06 seconds where, TOT is the Time of Transmission of the VDL Mode 3 burst relative to the VDL Mode 3 6-second time epoch as specified in the V-burst, D-burst or M-burst message.	T	ITHT	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
640	3.2.1.6.7 d)	MDR Transmitter Received HDLC Message Timing	When the MDR is in the Online state in VDL Mode 3 and RF transmission of a V-burst, D-burst, or M-burst has commenced, and the V-burst, D-burst or M-burst message(s) associated with the transmitted burst are received from the RIU in accordance with message timing parameters Tm1 through Tm5, the MDR shall perform continuous D8PSK modulation for the duration of the burst using data contained in the V-burst, D-burst or M-burst message.	T	ITHT	
641	3.2.1.6.8 a)	MDR Transmitter Received HDLC Message Sequencing	If the MDR is unable to complete processing of the first segment of a V-burst message (VFSN=1 in message header) in time to begin modulation at the time specified in Section 3.2.1.6.7c, the MDR shall discard the V-burst message and all remaining V-burst message segments associated with that V-burst, refrain from modulating the V-burst, and set the corresponding “V” underflow bit in the next RIU/MDR Status message that is sent to the RIU.	T	ITHT	
642	3.2.1.6.8 b)	MDR Transmitter Received HDLC Message Sequencing	When the MDR has commenced modulation of a V-burst and a V-burst message that contains voice segment 2, 3, 4 or 5 is not received in accordance with timing parameter Tm2, or a V-burst message that contains voice segment 6 is not received in accordance with timing parameter Tm3, the MDR shall continue V-burst modulation by repeating the data from the last valid voice frame received from the RIU and set the “V” underflow bit in the next RIU/MDR Status message that is sent to the RIU.	T	ITHT	
643	3.2.1.6.8 c)	MDR Transmitter Received HDLC Message Sequencing	If any of the six message segments in a D-burst are missing or received in error or received out of sequence, the MDR shall discard all message segments associated with the D-burst and refrain from modulating the D-burst.	T	ITHT	
644	3.2.1.6.8 d)	MDR Transmitter Received HDLC Message Sequencing	If the MDR is unable to complete D-burst message processing in time to begin modulation at the time specified in 3.2.1.6.7c, the MDR shall discard the D-burst message and all D-burst message segments associated with that D-burst, refrain from modulating the D-burst, and set the corresponding “D” underflow bit in the next RIU/MDR Status message that is sent to the RIU.	T	ITHT	
645	3.2.1.6.8 e)	MDR Transmitter Received HDLC Message Sequencing	If the MDR is unable to complete M-burst message processing in time to begin modulation at the time specified in 3.2.1.6.7c, the MDR shall discard the M-burst message, refrain from modulating the M-Burst, and set the corresponding “M” underflow bit in the next RIU/MDR Status message that is sent to the RIU.	T	ITHT	
646	3.2.1.6.8 f)	MDR Transmitter Received HDLC Message Sequencing	A Monitoring or Control message shall be deemed valid by the MDR transmitter if all segments of the message are received in sequence prior to the expiration of the T3 timer.	T	ITHT	
647	3.2.1.6.8 g)	MDR Transmitter Received HDLC Message Sequencing	For Monitoring or Control messages, if any message segment is received out of order, or if the T3 timer expires prior to the receipt of all message segments, all of the message segments shall be discarded.	T	ITHT	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
648	3.2.2.2 b)	MDR Transmitter Requirements	For single enclosure designs, both the 15 watt and 50 watt requirements shall be met unless otherwise specified.	LL	None	Single Enclosure Designs must meet all Transmitter requirements in Section 3.2.2.2 and subsections unless otherwise noted in FAA-E-2938.
649	3.2.2.2. 2.2 d)	Transmitter Time-Out - DSB-AM	Upon time-out, the MDR transmitter shall cease radiating until the input PTT key is released and re-asserted.	D	DMTT	
650	3.2.2.1. 8 d)	Receiver Frequency Tolerance - VDL Mode 3 and DSB-AM	The MDR receiver shall provide an output of the reference frequency signal on the front panel for measurement, testing and alignment.	I	PCON	
651	3.2.2.1. 8 e)	Receiver Frequency Tolerance - VDL Mode 3 and DSB-AM	An external reference frequency monitor port shall be provided with the following characteristics: 1. Impedance: 50 Ohm 2. REF FREQ Signal Level: 0 dBm (+/-3 dB)	A	ALOF	
652	3.2.2.1. 8 f)	Receiver Frequency Tolerance - VDL Mode 3 and DSB-AM	The REF FREQ monitor port shall be sufficiently isolated such that a short circuit applied from the monitor port to ground does not degrade the MDR performance.	A	ALOF	
653	3.3.2.3 a)	Reference Frequency Monitor Connector	The REF FREQ monitor connector shall be located on the front panel of the MDR receiver.	I	PCON	
654	3.3.2.3 b)	Reference Frequency Monitor Connector	The connector shall be a female BNC with shielded termination.	I	PCON	
655	3.3.2.3 c)	Reference Frequency Monitor Connector	The termination shall be attached to the MDR front panel via a short piece of metal chain.	I	PCON	
656	3.4.1.2.7 b)	Filter Tuning	The MDR transmitter shall be tunable within the spectral mask requirements specified in Section 3.2.2.2.10a and 3.2.2.2.10b, without the use of an external signal generator.	T	TAAP	
657	3.4.1.2.4 b)	Power Switches/Power On Indicators	An AC Power On indicator shall be located adjacent to the AC Power switch, and be lit when AC Power is applied to the MDR and the AC Power Switch is in the On position.	I	PDSP	
658	3.4.1.2.4 c)	Power Switches/Power On Indicators	A DC Power On indicator shall be located adjacent to the DC Power switch, and be lit when DC Power is applied to the MDR and the DC Power Switch is in the On position.	I	PDSP	
659	3.2.3. 8	Event Log Readback	The MDR shall reply to a Control Parameter #30, Request Readback containing ID=1, (Event Log) with the Event Log entries that match the Filter and Data criteria, as follows: (See table in Section 3.2.3.8)	D	DMDR	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
660	3.2.3. 9.3 d)	Security Procedures	Validation of the security token contained in the Log-In shall be performed using only non-null public keys with Public Key ID of 0 to 4.	D	DMDS	
661	3.2.3. 9.3.1 b)	Software Upload Security	Validation of the software binary image and digital signature contained in the Software upload shall be performed using only non-null public keys with Public Key ID of 5 to 9.	D	DMDS	
662	3.2.3. 5.26 a)	Receiver Mute Level Setting (ID=39)	The receiver mute level setting parameter shall: 1) Indicate the setting of the Receiver Mute Level parameter as per Sections 3.2.2.1.12.2c and 3.2.2.1.12.2e 2) Be of three discrete values, either “-15 dBm”, “-20 dBm” or “No Audio” 3) Be applicable to the MDR receiver 4) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
663	3.2.3. 5.27 a)	PTT Setting (ID=40)	The PTT setting parameter shall: 1) Indicate the PTT setting of the transmitter as per Section 3.2.2.2.12. 2) Be of three discrete values:"USER_KEYED", “TEST_KEYED” or “NOT_KEYED” 3) Be applicable to the MDR transmitters 4) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
664	3.2.3. 5.37 a)	Measured Power Output (AM) (ID=57)	The measured power output parameter shall: 1) Indicate the current RF transmission power at the antenna connector of the MDR transmitter to support Section 3.2.2.2.5.2 2) Be a power level in dBm 3) Have an alarm setting of 0 that disables the measurement 4) Have a minimum value for the 15 watt MDR transmitter configuration of 30 dBm 5) Have a minimum value for the 50 watt MDR transmitter configuration of 37 dBm 6) Have a minimum value of 30 dBm if a single MDR transmitter enclosure is used for both 15W and 50W requirements 7) Have a maximum value for the 15 watt MDR transmitter configuration of 45 dBm 8) Have a maximum value for the 50 watt MDR transmitter configuration of 50 dBm 9) Have a maximum value of 50 dBm if a single MDR transmitter enclosure is used for both 15W and 50W requirements 10) Have a resolution (step size) of 0.5 dB for all MDR transmitter configuration 11) Reserved 12) Have a tolerance (acceptable error) of +/-2 dB for all MDR transmitters 13) Have an alarm value of +/-2 dB of the Power Output Setting (ID 12) 14) Be applicable to the MDR transmitters 15) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
665	3.2.3. 5.38 a)	Measured Transmitter Modulation (AM) (ID=58)	The measured transmitter modulation % parameter shall: 1) Indicate the actual Transmitter modulation % of the MDR transmitter in support of Section 3.2.2.2.4 2) Be in percent and averaged over 3 second PTT intervals 3) Have an alarm setting of 0 that disables the measurement 4) Have a minimum value of 0 percent 5) Have a maximum value of 100 percent 6) Have at least 100 steps 7) Have a tolerance (acceptable error) of +/-5 percent 8) Have an alarm value of greater than 99 percent 9) Be applicable to the MDR transmitters 10) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
666	3.2.3.12 a)	MDR Failure Detection and Reporting	The MDR shall detect and report critical equipment failures to the local and remote MMC access points automatically when the MDR is in the Offline and Online states, and during Recovery.	D	DMAP	RIU not verified in this test case
667	3.2.2.1.28.2 a)	Receiver Power Measurement - DSB-AM	The accuracy of the MDR receiver power measurement reported to the RIU in the PCM voice message shall be +/- 3dB over the input signal range specified by the RF Input Power Level parameter in Table 3-4.	A	ARPM	See Table 3-4
668	3.2.3. 5.28 a)	Public Key List (ID=41)	The public key list parameter shall: 1) Indicate the public keys that are stored by the MDR as per Section 3.2.3.9.2c 2) Include the following fields: MDR ID Number, and ten sets of Key ID and Key 3) Be applicable to the MDR receiver and MDR transmitters 4) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
669	3.2.3. 9.3.2 a)	Control Session	The MDR shall initiate a control session upon successful authentication of RIU or MDT log on / security token.	D	DMDS	RIU not verified in this test case
670	3.2.2.1.12.2 f)	Receiver Audio Mute and Attenuation - DSB-AM	The MDR receiver shall mute audio when either the control parameter ID#11 or the input from the Receiver Remote connector (RCE) indicate audio muting, and unmute when both indicate no mute.	D	DMCP	
671	3.4.1.2.5 d)	Front Panel Display	The MDR transmitters' front panel shall have an additional blue visual indicator, physically separate from the other visual indicators, that indicates PTT keying while in DSB-AM mode.	I	PDSP	
672	3.4.1.2.5 f)	Front Panel Display	The visual indicators shall be viewable for at least +/- 60 degrees off horizontal or vertical axis and be clearly visible from 10 feet away in a brightly lit room.	D	DMAP	
673	3.2.2.1. 1.2 c)	Receiver Digital and Audio Interfaces - DSB-AM	The (front panel) local audio output shall be active whether the MDR receiver is generating analog audio output or PCM audio output.	D	DMCP	No PCM

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676	3.4.1.1.15 c)	Safety	Any exposed or accessible area of the MDR equipment that could pose a thermal contact hazard, as defined in the FAA Human Factors Guide, section 12.10.1, shall be clearly labeled as a Thermal Contact Hazard.	A	ASAF	
677	3.2.2.2.14 o)	ATR Operation	The ATR Switch shall not degrade: 1) Performance of the transmitter connected directly to the antenna; 2) Performance of the transmitter connected to the antenna through its ATR switch; 3) Performance of a second transmitter connected to the antenna through the ATR switch; 4) Performance of the receiver connected to the antenna through the ATR switch, except as specified in Section 3.2.2.2.14n.	A/T	AATR/SATR	AATR - for VDL Mode 3, SATR - for DSB-AM
678	3.2.2.2. 5 d)	Transmitter RF Output Power	The MDR transmitter shall meet the output power levels specified in either the remotely tuned configuration or the fixed tuned configuration.	T	TARF	
679	3.2.2.1. 3 b)	Receiver Sensitivity	The sensitivity values shall be achieved with the MDR in the remotely tuned configuration or the fixed tuned configuration.	T	RASN	
680	3.2.2.1.13.2 a)	Receiver Average Audio Output - DSB-AM	After adjusting the MDR receiver Audio Output Level setting (Control Parameter ID#10) to produce an –8 dBm audio output from an RF input of –87 dBm 30 percent modulated with a 400 Hz tone, the MDR receiver shall generate, with no further audio level adjustment, at the Main Audio Output: 1) an average audio output of –13 dBm (+/-2 dB) averaged over 3 seconds, and 2) a peak audio output that does not exceed 0 dBm from an RF input of –87 dBm 90 percent modulated with FAA approved speech sample.	A	ARAV	
681	3.4.1.3 a)	MDR Identification (ID) Numbering	Each MDR shall have a permanent, non-changeable and unique identification (ID) number which is both marked on the front panel and accessible via the Monitoring Parameter ID#50, MDR ID number.	D	DMMR	
682	3.4.1.3 b)	MDR Identification (ID) Numbering	MDR ID numbers shall be assigned so that Transmitter ID numbers are odd numerically and Receiver ID numbers are even numerically.	D	DMMR	
683	3.4.1.3 c)	MDR Identification (ID) Numbering	MDR ID numbers shall be as specified in Section 3.2.3.5.30.	D	DMMR	
684	3.4.2.1 i)	Input Power Requirements	Automatic switching between power sources in the event of power loss of one power source shall occur regardless of the primary power source selection.	T	SYIP	
685	3.4.2.1 j)	Input Power Requirements	Manual or automatic switching between power sources shall not interrupt MDR operation nor degrade MDR performance.	T	SYIP	
686	3.4.1.2.4 d)	Power Switches/Power On Indicators	The MDR shall provide visual indication of which power source, AC or DC, is selected as primary.	I	PDSP	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
687	3.2.2.2. 5.1 c) 1)	Transmitter RF Output Power - VDL Mode 3, Single Enclosure Configuration Power Output	The MDR transmitter shall deliver the RF output (averaged over a V/D-burst or M-burst) as specified in the header of the burst into a nominal 50 ohm load impedance.	T	TVRF	
688	3.2.2.2. 5.1 c) 2)	Transmitter RF Output Power - VDL Mode 3, Single Enclosure Configuration Power Output	The MDR transmitter RF output shall be adjustable in 0.5 dB steps over the range from 2 watts to 50 watts.	T	TVRF	0.5dB step size will not be verified during OCT
689	3.2.2.2. 5.1 c) 3)	Transmitter RF Output Power - VDL Mode 3, Single Enclosure Configuration Power Output	The MDR transmitter shall deliver not less than 50 percent of the set RF signal power into any impedance having a maximum VSWR of 3:1 at any phase angle.	T	TVRF	
690	3.2.2.2. 5.2 c) 1)	Transmitter RF Output Power - DSB-AM, Single Enclosure Configuration Power Output	The MDR transmitter shall deliver the RF output as specified in the Control Parameter #12, Power Output, into a nominal 50 ohm load impedance when transmitting a CW signal.	T	TARF	
691	3.2.2.2. 5.2 c) 2)	Transmitter RF Output Power - DSB-AM, Single Enclosure Configuration Power Output	The MDR transmitter shall be adjustable in nominal 0.5 dB steps over the range from 2 watts to 50 watts maximum unmodulated CW RF power.	D	DMPO	
692	3.2.2.2. 5.2 c) 3)	Transmitter RF Output Power - DSB-AM, Single Enclosure Configuration Power Output	The MDR transmitter shall deliver not less than 50 percent of the set CW RF signal power into any impedance having a maximum VSWR of 3:1 at any phase angle.	T	TARF	
693	3.2.2.2.14 c)	ATR Operation	The ATR shall operate on one of two modes: 1) Static Mode, where the switch state is controlled by an explicit command from the RUI or MDT: and 2) Dynamic Mode, where the switch state is controlled be the local MDR’s need to transmit.	A	AATR	
694	3.2.3. 2.21A a)	ATR Switch Mode (ID=22)	The ATR switch mode parameter shall: 1) Control the mode of operation for the ATR switch 2) Be two discrete values: Static or Dynamic 3) Have a default value of: Static 4) Be applicable to the MDR transmitters 5) Have a message/bit format that complies with the MDR/ICU ICD NAS-IC-41033502.	D/T	DMCP/IMCP	DMCP by Test Method "D"/IMCP by test method "T"

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
695	3.2.3. 5.21A a)	ATR Switch Mode (ID=22)	The ATR switch mode parameter shall: 1) Indicate the mode of operation for the ATR switch 2) Be one of two discrete values: Static or Dynamic 3) Be applicable to the MDR transmitter 4) Have a bit/message format that complies with the MDR/RIU ICD NAS-IC-41033502	D/T	DMMR/IMMP	DMMR by Test Method "D"/IMMP by Test Method "T"
696	3.2.2.1.12.2 g)	Receiver Audio Mute and Attenuation - DSB-AM	The MDR receiver shall provide a confirmation signal via the Receiver Remote connector (RCE) for the duration of the mute.	D	DMCP	
697	3.2.2.2.12 a)	Transmitter Keying	The MDR transmitter shall provide a Transmit Indicator signal via the Transmitter remote connector (RCE) for the duration of the transmissions.	A/T	AATR/TAKY	AATR - For VDL Mode 3, TAKY - for DSB-AM
698	3.2.2.2.12.1 a)	Transmitter Keying - VDL Mode 3	The MDR transmitter shall output the Transmit Indicator signal within +-10 microseconds of the leading edge of the first D8PSK symbol of the RF ramp-up and disable the signal +/-10 microseconds of the falling edge of the last D8PSK symbol of the RF ramp-down.	A	AATR	
699	3.2.3. 6.1 b)	Automatic State Transition Log Entry	The Event Type field shall contain a coded indication of the event type.	D	DMDR	
700	3.4.2.1 h)	Input Power Requirements	If both AC and DC power are not available to the MDR, the MDR shall operate off of the power source selected by the Primary Power Source Switch.	T	SYIP	
701	3.2.1.6.2 c)	Link Control	While in the link active state, the MDR shall ignore all UI-frame-based messages that are not MDR/RIU Status messages.	T	ILLI	See TC – Link “Inactive”

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
1	3. 2 a)	Minimum Maintenance Data Terminal Platform (MDTS Host Computer)	The MDTS shall meet specified requirements while operating on industry standard laptop/notebook Personal Computers that are configured with at least the following: 1) Windows 95, 98, 2000 and NT 2) 100 Mb of Hard Drive space for MDTS exclusive use 3) 32 Mb of RAM 4) 800x600x8 display 5) Pentium 200 processor 6) RS-232 serial interface using DB-9 connector 7) Single Standard High Density Floppy drive	D	DMDT	DRAFT Version 0.0
2	3. 3 a)	Secured Access	The MDTS shall identify and authenticate the MDTS operator by User ID, of up to 20 characters, and Password, of at least 8 characters/numerals, before allowing operator access to MDTS functions.	D	DMDS	
3	3. 3 b)	Secured Access	All passwords and password authentication data stored within the MDTS, or on the MDT platform, shall be encrypted.	A	ASSC	
4	3. 3 c)	Secured Access	The MDTS shall store a security token and transfer it as defined by FAA-E-2939 Section 3.2.3.9.4.	A	ASSC	
5	3. 3 d)	Secured Access	The security token shall be stored in such a way that its function is not discernable.	A	ASSC	
6	3. 4 a)	Log In	The MDTS shall detect connection to an MDR, and log into the MDR, by issuing control parameter ID#1, Log-In, as specified in FAA-E-2938, Section 3.2.3.2.1.	D	DMDS	
7	3. 4 b)	Log In	The MDTS shall provide the MDT platform’s unique identification number (for example, the Windows operating system OEM number) as the Terminal identification field in control parameter ID#1, Log-In/Log-Out, as specified in FAA-E-2938, Section 3.2.3.2.1	D	DMDS	
8	3. 4 c)	Log In	A user configurable number of seconds (with zero meaning disable) after the MDTS User commands an MDR to Reset, the MDTS shall automatically attempt to log into the reset MDR, to re-establish a control session.	D	DMDS	
9	3. 5 a)	Log Out	Upon operator command, the MDTS shall log out of the MDR by issuing control parameter ID#1, Log-In/Log-Out, as specified in FAA-E-2938, Section 3.2.3.2.1, without the Security Token.	D	DMDS	
10	3. 6 a)	Display of Monitored Parameters	MDTS shall display operator selected MDR Monitored parameters and Control parameters, listed in table 3-3 and table 3-4, of the MDR specification.	D	DMCP/DMMR	
11	3. 6 b)	Display of Monitored Parameters	MDTS shall allow operator to select either numeric or graphical (e.g. bar graph or simulated meter) type display for each parameter selected for display.	D	DMMR	
12	3. 6 c)	Display of Monitored Parameters	MDTS shall allow operator to select and display at least 3 parameters simultaneously.	D	DMMR	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
13	3. 6 d)	Display of Monitored Parameters	MDTS shall allow the operator to select one-shot read, or continuous (near real time) read and display of Monitored Parameters.	D	DMMR	
14	3. 6 e)	Display of Monitored Parameters	When continuous (near real-time) read and display is selected for a parameter, the MDTS shall issue control parameter ID#30 Request Readback (with appropriate data) to the MDR at the operator-specified rate of once per second (approximately) to once per 240 milliseconds.	D	DMMR	
15	3. 6 f)	Display of Monitored Parameters	MDTS shall update the display of operator-selected monitored parameters with each new readback sample when continuous read (near real time) read and display is selected.	D	DMMR	
16	3. 7 a)	Setting of Control Parameters	The MDTS shall allow the operator to change the values of each MDR Control parameter.	D	DMCP	
17	3. 7 b)	Setting of Control Parameters	After an operator commanded control parameter change, the MDTS shall update the display of the current value of the Control Parameter with the then-current value.	D	DMCP	
18	3. 7 c)	Setting of Control Parameters	MDTS shall display any error messages generated by the MDR relating to the attempt to change the value of the control parameter.	D	DMCP	
19	3. 8 a)	Alarm/Alert Threshold Setting	MDTS shall allow operator to read the MDR values for alarm thresholds and alert thresholds.	D	DMAP	
20	3. 8 b)	Alarm/Alert Threshold Setting	MDTS shall allow operator to change the alarm minimum thresholds, alarm maximum thresholds, alert minimum thresholds and alert maximum thresholds independently.	D	DMAP	
21	3. 8 c)	Alarm/Alert Threshold Setting	MDTS shall display any error messages generated by MDR relating to the attempt to set the minimum thresholds equal or greater than the maximum thresholds.	D	DMAP	
22	3. 9 a)	Control Parameter Sets	MDTS shall store at least fifteen control parameter sets, with operator selectable set labels, which can be selected for downloading from, or uploading to the MDR.	D	DMCP	
23	3. 9 b)	Control Parameter Sets	MDTS shall allow the operator to edit the Control Parameter values in each control parameter set.	D	DMCP	
24	3. 9 c)	Control Parameter Sets	MDTS shall, upon operator command, download from the MDR all Control Parameter values, associate them with their Control Parameter ID numbers, apply the operator-selected file name or label and store the Control Parameter set.	D	DMCP	
25	3. 9 d)	Control Parameter Sets	MDTS shall, upon operator command, upload the operator-selected control parameter set to the MDR.	D	DMCP	
26	3. 9 e)	Control Parameter Sets	MDTS shall verify all Control Parameter settings before indicating successful Control Parameter set uploads.	D	DMCP	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
27	3. 9 f)	Control Parameter Sets	MDTS shall allow the operator to store Control Parameter sets on, or retrieve Control Parameter sets from, floppy disks.	D	DMCP	
28	3. 9 g)	Control Parameter Sets	MDTS shall allow the operator to specify whether each Control Parameter Set for uploading to the MDR contains all, or a subset of, the control parameters.	D	DMCP	
29	3.10 a)	Alarm/Alert Threshold Sets	MDTS shall store at least nine Alarm/Alert Threshold sets with operator selectable set labels, which can be selected for downloading from, or uploading to the MDR.	D	DMAP	
30	3.10 b)	Alarm/Alert Threshold Sets	MDTS shall allow the operator to edit the alarm/alert threshold values in each alarm/alert threshold set.	D	DMAP	
31	3.10 c)	Alarm/Alert Threshold Sets	MDTS shall, upon operator command, download from the MDR the alarm/alert threshold set, apply the operator-selected file name or label and store the alarm/alert threshold set.	D	DMAP	
32	3.10 d)	Alarm/Alert Threshold Sets	MDTS shall, upon operator command, upload the operator-selected alarm/alert threshold set.	D	DMAP	
33	3.10 e)	Alarm/Alert Threshold Sets	MDTS shall verify each alarm/alert threshold setting before indicating successful alarm/alert threshold set upload.	D	DMAP	
34	3.11 a)	Operating Software Sets	MDTS shall store at least four MDR Operating Software sets which can be selected for downloading from, or uploading to the MDR.	D	DMCP	
35	3.11 b)	Operating Software Sets	MDTS Operating Software set shall contain one version of software (code).	D	DMCP	
36	3.11 c)	Operating Software Sets	MDTS shall, upon double-verified operator command, upload to the MDR the operator selected MDR Operating Software set.	D	DMCP	
37	3.11 d)	Operating Software Sets	MDTS shall display the Digital Signature authentication result provided in by the MDR after software download to the Operating Software set.	D	DMCP	
38	3.12 a)	Recording of Monitored Parameters	MDTS shall, upon operator command, record the operator-selected continuous, real-time read/displayed monitored parameters, for later review and analysis.	D	DMMR	
39	3.12 b)	Recording of Monitored Parameters	MDTS monitored parameter recording shall be discontinuable at any time after initiation.	D	DMMR	
40	3.12 c)	Recording of Monitored Parameters	MDTS monitored parameter recording rate shall be operator selectable from 1 sample per minute (approx. to 1 sample per 240 milliseconds.	D	DMMR	
41	3.12 d)	Recording of Monitored Parameters	MDTS monitored parameter recording shall store up to 15,000 samples per recorded parameter.	D	DMMR	
42	3.12 e)	Recording of Monitored Parameters	MDTS monitored parameter recording shall record at least two parameters simultaneously, while displaying at least two monitored parameters.	D	DMMR	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
43	3.12 f)	Recording of Monitored Parameters	MDTS monitored parameter recording shall record parameter ID, value and recording time.	D	DMMR	
44	3.12 g)	Recording of Monitored Parameters	MDTS shall allow control parameter setting while recording.	D	DMMR	
45	3.13 a)	Local Diagnostic Audible Indication Function	MDTS shall provide an audible alert function, which will provide a MDT generated tone when the operator-selected parameter crosses an operator-selected high and/or low threshold.	D	DMAP	
46	3.13 b)	Local Diagnostic Audible Indication Function	MDTS shall provide an audible alert function, which will provide a MDT generated tone when the selected parameter achieves peak/valley (min/max) values.	D	DMAP	
47	3.14 a)	MDR Event Log Download	MDTS shall store at least fifty MDR Event Logs, with operator selectable Log labels, which can be selected for downloading from to the MDR.	D	DMDR	
48	3.14 b)	MDR Event Log Download	MDTS shall, upon operator command, download from the MDR the MDR Event Log, apply the operator-selected file name or label, and store the MDR Event Log.	D	DMDR	
49	3.14 c)	MDR Event Log Download	MDTS shall allow operator to view the MDR Event Log.	D	DMDR	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
2	3.2.2.1.4.3.2.15	Software Version (ID 15)	The bit format of the Software Version parameter shall be encoded/decoded as indicated in Figure 3-50.	T	IMMP	ICD Version 1.00
4	3.2.2.1.4.3.2. 5	MDR State (ID 5)	The bit format of the MDR State parameter shall be encoded/decoded as indicated in Figure 3-40.	T	IMMP	
8	3.2.2.1.4.3.2. 3	Lowest Tunable Frequency (ID 3)	The bit format of the Lowest Tunable Frequency parameter shall be encoded/decoded as indicated in Figure 3-38.	T	IMMP	
12	3.2.2.1.4.3.2.36	MDR ID Number (ID 50)	The bit format of the MDR ID Number parameter shall be encoded/decoded as indicated in Figure 3-66.	T	IMMP	
14	3.2.2.1.4.3.2.20	Transmitter Timeout Setting (AM) (ID 20)	The bit format of the Transmitter Timeout Setting parameter shall be encoded/decoded as indicated in Figure 3-55.	T	IMMP	
16	3.2.2.1.4.3.2.12	Power Output Setting (AM) (ID 12)	The bit format of the Power Output Setting parameter shall be encoded/decoded as indicated in Figure 3-47.	T	IMMP	
18	3.2.2.1.4.3.2.13	Transmitter Modulation % Setting (AM) (ID 13)	The bit format of the Transmitter Modulation % Setting parameter shall be encoded/decoded as indicated in Figure 3-48.	T	IMMP	
20	3.2.2.1.4.3.2.37	RF Input Power Level (AM) (ID 51)	The bit format of the RF Input Power Level parameter shall be encoded/decoded as indicated in Figure 3-67.	T	IMMP	
24	3.2.2.1.4.3.2.21	Squelch Enable/Disable (AM) (ID 21)	The bit format of the Squelch Enable/Disable parameter shall be encoded/decoded as indicated in Figure 3-56.	T	IMMP	
26	3.2.2.1.4.3.2.38	Squelch Break Status (AM) (ID 52)	The bit format of the Squelch Break Status parameter shall be encoded/decoded as indicated in Figure 3-68.	T	IMMP	
28	3.2.2.1.4.3.2. 8	Squelch RF Threshold Level Setting (AM) (ID 8)	The bit format of the Squelch RF Threshold Level Setting parameter shall be encoded/decoded as indicated in Figure 3-43.	T	IMMP	
32	3.2.2.1.4.3.2.39	In-Service Time (ID 53)	The bit format of the In-Service Time parameter shall be encoded/decoded as indicated in Figure 3-69.	T	IMMP	
34	3.2.2.1.4.3.2. 4	Mode of Operation (ID 4)	The bit format of the Mode of Operation parameter shall be encoded/decoded as indicated in Figure 3-39.	T	IMMP	
36	3.2.2.1.4.3.2. 2	Current Frequency (ID 2)	The bit format of the Current Frequency parameter shall be encoded/decoded as indicated in Figure 3-37.	T	IMMP	
38	3.2.2.1.4.3.2. 7	Time (ID 7)	The bit format of the Time parameter shall be encoded/decoded as indicated in Figure 3-42.	T	IMMP	
44	3.2.2.1.4.3.2.11	Receiver Mute (AM) (ID 11)	The bit format of the Receiver Mute parameter shall be encoded/decoded as indicated in Figure 3-46.	T	IMMP	
48	3.2.2.1.4.3.2.10	Audio Output Level (AM) (ID 10)	The bit format of the Audio Output Level parameter shall be encoded/decoded as indicated in Figure 3-45.	T	IMMP	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
50	3.2.2.1.4.3.2.40	RIU Timing Offset Change (VDL Mode 3) (ID 54)	The bit format of the RIU Timing Offset Change parameter shall be encoded/decoded as indicated in Figure 3-70.	T	IMMP	
54	3.2.2.1.4.3.2. 1	Event Log (ID 1)	The bit format of the Event Log parameter shall be encoded/decoded as indicated in Figure 3-36.	T	IMMP	
66	3.2.2.1.4.3.2.41	Transmit Antenna VSWR (ID 55)	The bit format of the Transmit Antenna VSWR parameter shall be encoded/decoded as indicated in Figure 3-71.	T	IMMP	
69	3.2.2.1.4.3.2.14	ATR Switch State (ID 14)	The bit format of the ATR Switch State parameter shall be encoded/decoded as indicated in Figure 3-49.	T	IMMP	
75	3.2.2.1.4.3.2.16	N1 (Number of Information Bits) (ID 16)	The bit format of the N1 parameter shall be encoded/decoded as indicated in Figure 3-51.	T	IMMP	
77	3.2.2.1.4.3.2.17	T1 (Link Response Timer) (ID 17)	The bit format of the T1 parameter shall be encoded/decoded as indicated in Figure 3-52.	T	IMMP	
79	3.2.2.1.4.3.2.18	T3 (Reassembly Timer (ID 18)	The bit format of the T3 parameter shall be encoded/decoded as indicated in Figure 3-53.	T	IMMP	
81	3.2.2.1.4.3.1. 1	Log-In/Log-Out (ID 1)	The bit format of the Log-In/Log-Out parameter shall be encoded/decoded as indicated in Figure 3-3.	T	IMCP	
83	3.2.2.1.4.3.1. 2	Current Frequency (ID 2)	The bit format of the Current Frequency parameter shall be encoded/decoded as indicated in Figure 3-4.	T	IMCP	
87	3.2.2.1.4.3.1. 3	Lowest Tunable Frequency (ID 3)	The bit format of the Lowest Tunable Frequency parameter shall be encoded/decoded as indicated in Figure 3-5.	T	IMCP	
89	3.2.2.1.4.3.1. 4	Mode of Operation (ID 4)	The bit format of the Mode of Operation parameter shall be encoded/decoded as indicated in Figure 3-6.	T	IMCP	
91	3.2.2.1.4.3.1. 5	MDR State (ID 5)	The bit format of the MDR State parameter shall be encoded/decoded as indicated in Figure 3-7.	T	IMCP	
93	3.2.2.1.4.3.1. 6	Threshold Setting (ID 6)	The bit format of the Threshold Setting parameter shall be encoded/decoded as indicated in Figure 3-8a.	T	IMCP	
95	3.2.2.1.4.3.1.23	Request Read Back (ID 30)	The bit format of the Request Read Back parameter shall be encoded/decoded as indicated in Figure 3-25a.	T	IMCP	
97	3.2.2.1.4.3.1. 7	Time (ID 7)	The bit format of the Time parameter shall be encoded/decoded as indicated in Figure 3-9.	T	IMCP	
99	3.2.2.1.4.3.1. 8	Squelch RF Threshold Level Setting (AM) (ID 8)	The bit format of the Squelch RF Threshold Level Setting parameter shall be encoded/decoded as indicated in Figure 3-10.	T	IMCP	
103	3.2.2.1.4.3.1.10	Audio Output Level (AM) (ID 10)	The bit format of the Audio Output Level parameter shall be encoded/decoded as indicated in Figure 3-12.	T	IMCP	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
105	3.2.2.1.4.3.1.11	Receiver Mute (AM) (ID 11)	The bit format of the Receiver Mute parameter shall be encoded/decoded as indicated in Figure 3-13.	T	IMCP	
107	3.2.2.1.4.3.1.12	Power Output (AM) (ID 12)	The bit format of the Power Output parameter shall be encoded/decoded as indicated in Figure 3-14.	T	IMCP	
109	3.2.2.1.4.3.1.13	Transmitter Modulation % (AM) (ID 13)	The bit format of the Transmitter Modulation % parameter shall be encoded/decoded as indicated in Figure 3-15.	T	IMCP	
111	3.2.2.1.4.3.1.20	Transmission Timeout (AM) (ID 20)	The bit format of the Transmission Timeout parameter shall be encoded/decoded as indicated in Figure 3-22.	T	IMCP	
113	3.2.2.1.4.3.1.24	Audio Input Level (AM) (ID 31)	The bit format of the Audio Input Level parameter shall be encoded/decoded as indicated in Figure 3-26.	T	IMCP	
119	3.2.2.1.4.3.1.27	MAC Timing Offset Correction (VDL Mode 3) (ID 34)	The bit format of the MAC Timing Offset Correction parameter shall be encoded/decoded as indicated in Figure 3-27.	T	IMCP	
121	3.2.2.1.4.3.1.14	ATR Switch State (ID 14)	The bit format of the ATR Switch State parameter shall be encoded/decoded as indicated in Figure 3-16.	T	IMCP	
123	3.2.2.1.4.3.1.28	Suppress Alert/Alarm (ID 35)	The bit format of the Suppress Alert/Alarm parameter shall be encoded/decoded as indicated in Figure 3-28.	T	IMCP	
125	3.2.2.1.4.3.1.29	Reset (ID 36)	The bit format of the Reset parameter shall be encoded/decoded as indicated in Figure 3-29.	T	IMCP	
127	3.2.2.1.4.3.1.30	Software Upload Enable/Disable (ID 37)	The bit format of the Software Upload Enable/Disable parameter shall be encoded/decoded as indicated in Figure 3-30.	T	IMCP	
129	3.2.2.1.4.3.1.15	Switch Software Version (ID 15)	The bit format of the Switch Software Version parameter shall be encoded/decoded as indicated in Figure 3-17.	T	IMCP	
131	3.2.2.1.4.3.1.31	Software Upload (ID 38)	The bit format of the Software Upload parameter shall be encoded/decoded as indicated in Figure 3-31.	T	IMCP	
135	3.2.2.1.4.3.1.16	N1 (Number of Information Bits) (ID 16)	The bit format of the N1 parameter shall be encoded/decoded as indicated in Figure 3-18.	T	IMCP	
137	3.2.2.1.4.3.1.17	T1 (Link Response Timer) (ID 17)	The bit format of the T1 parameter shall be encoded/decoded as indicated in Figure 3-19.	T	IMCP	
139	3.2.2.1.4.3.1.18	T3 (Reassembly Timer) (ID 18)	The bit format of the T3 parameter shall be encoded/decoded as indicated in Figure 3-20.	T	IMCP	
140	3.2.2.1.4.3.3.1	MDR Transmitter Status Word	For the MDR transmitters, the RIU/MDR Status Word shall comprise the fields specified in Table 3-3.	T	ITLS	See Table 3-3

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
141	3.2.2.1.4.3.3.1.1	Status (S)	The S bits indicate the operational status of the MDR component and shall be encoded as follows: 0 = Offline 1 = Power Down (if exercised) 2 = Power Up 3 = Online 4-5 = Reserved 6 = Recovery 7 = Fail.	T	ITLS	
142	3.2.2.1.4.3.3.1.2	RIU Timing Status (T)	The T bit shall be encoded as follows: 0 = MDR MAC cycle timing not locked to 6-second epoch 1 = MDR MAC cycle timing locked to 6-second epoch.	T	ITLS	
143	3.2.2.1.4.3.3.1.3	Invalid RIU Data (I)	The I bit shall be encoded as 1 if any invalid data was received from the RIU during the last MAC cycle, or 0 otherwise.	T	ITLS	
144	3.2.2.1.4.3.3.1.4	T1 Frame Slip (F)	The F bit shall be encoded as 1 if a T1 Frame Slip was detected on the link from the RIU, or 0 otherwise.	T	ITLS	
146	3.2.2.1.4.3.3.1.6	M-Channel Data Underflow (M)	The M bit shall be encoded as 1 if any M-channel data within the last MAC cycle was not received from the RIU in time to be modulated, or 0 otherwise.	T	ITLS	
147	3.2.2.1.4.3.3.1.7	V-Channel Data Underflow (V)	The V bit shall be encoded as 1 if any Voice Channel data within the last MAC cycle was not received from the RIU in time to be modulated, or 0 otherwise.	T	ITLS	
148	3.2.2.1.4.3.3.1.8	D-Channel Data Underflow (D)	The D bit shall be encoded as 1 if any Data Channel data within the last MAC cycle was not received from the RIU in time to be modulated, or 0 otherwise.	T	ITLS	
149	3.2.2.1.4.3.3.2	MDR Receiver RIU/MDR Status Word	For the MDR receiver, the RIU/MDR Status word shall comprise the fields specified in Table 3-4.	T	IRLS	See Table 3-4
150	3.2.2.1.4.3.3.2.1	Status (S)	The S bits indicate the operational status of the MDR component and shall be encoded as follows: 0 = Offline 1 = Power Down (if exercised) 2 = Power Up 3 = Online 4-5 = Reserved 6 = Recovery 7= Fail.	T	IRLS	
151	3.2.2.1.4.3.3.2.2	RIU Timing Status (T)	The T bit shall be encoded as follows: 0 = MDR MAC cycle timing not locked to 6-second epoch 1 = MDR MAC cycle timing locked to 6-second epoch.	T	IRLS	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
152	3.2.2.1.4.3.3.2.3	Invalid RIU Data (I)	The I bit shall be encoded as 1 if any invalid data was received from the RIU during the last MAC cycle, or 0 otherwise.	T	IRLS	
153	3.2.2.1.4.3.3.2.4	T1 Frame Slip (F)	The F bit shall be encoded as 1 if a T1 Frame Slip was detected on the link from the RIU, or 0 otherwise.	T	IRLS	
158	3.2.2.6.1	HDLC Frame Structure	All non-segmented messages or individual message segments (of a segmented message) sent between the MDR and RIU shall be transmitted within one frame.	T	IDLL	
159	3.2.2.6.1.1	Flag Sequence Field	The Flag (F) Sequence field appears at the beginning and end of all frames and shall consist of one 0 bit followed by six contiguous 1 bits and one 0 bit.	T	IDLL	
160	3.2.2.6.1.2	Address Field	For all HDLC messages except the TEST Response message, the AD field shall contain the address of the unit to which the information sequence in the frame is sent.	T	IDLL	
161	3.2.2.6.1.3	Control Field	The Control (CN) field consists of one octet and shall be used to identify the frame type, either TEST or Unnumbered Information (UI).	T	IDLL	
162	3.2.2.6.1.4	Information Field	In a UI frame, the I field shall contain a message.	T	IDLL	
163	3.2.2.6.1.4	Information Field	The I field shall consist of an integral number of octets.	T	IDLL	
164	3.2.2.6.1.5	Frame Check Sequence Field	The Frame Check Sequence (FCS) field shall consist of 16-bits and be used for frame error detection.	T	IDLL	
165	3.2.2.6.2.1	Link Initialization	These two states of operation shall be defined as the link inactive state and link initialized state.	T	ILLI	
166	3.2.2.6.2.1	Link Initialization	The Link Initialization procedure shall consist of the RIU generating a Test Command to the MDR with a four octet (octet 1 is MSB, octet 4 is LSB) I field consisting of a sequence number starting at zero and incrementing by one with each retransmission.	T	ILLI	
168	3.2.2.6.2.3	Link Clearing	While in the link initialized state, the initiator of the Link Clearing procedure shall send a TEST Command message with a five-octet information field, the first four octets (octet 1 is MSB, octet 4 is LSB) containing all ONEs indicating a clear, followed by a one octet clearing cause code.	T	ILCF	
169	3.2.2.6.2.3	Link Clearing	The recipient of the line clearing procedure shall confirm the clear by issuing a TEST Response with the first four octets set to all ONEs.	T	ILCF	
171	3.2.2.6.4	HDLC Frame Timing	The timing and size of HDLC frame transmissions between the MDR and RIU shall be controlled such that the voice delay from start of first bit at the originator (MDR/RIU) to the reception of the last bit at the recipient (RIU/MDR), due to the HDLC frame transmission, does not exceed 3 ms.	T	IHFT	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
172	3.2.2.6.5	Link Level Message Description	Each message exchanged across the data interface shall contain a one octet Message ID followed by the message.	T	IDBM/ILSM/IMBM/IPVM/IRCM/IRMM/ISCM/IVBM	
176	3.2.2.6.5.1.1	Voice-Burst Message	The Voice-Burst message shall be encoded as illustrated in Figure 3-77 with the field descriptions shown in Table 3-8.	T	IVBM	
178	3.2.2.6.5.1.2	Data-Burst Message	The Data-Burst message shall be encoded as illustrated in Figure 3-78 with the field descriptions shown in Table 3-9.	T	IDBM	
180	3.2.2.6.5.1.3	Management-Burst Message	The Management-Burst message shall be encoded as illustrated in Figure 3-79 with the field descriptions shown in Table 3-10.	T	IMBM	
183	3.2.2.6.5.1.3	Management-Burst Message	The Synchronization Header Type (STYPE) field shall be encoded per Table 3-10a.	T	IMBM	
186	3.2.2.6.5.1.4	Sync Search Control Message	The Sync Search Control message shall be encoded as illustrated in Figure 3-80 with the field descriptions shown in Table 3-11.	T	ISCM	
191	3.2.2.6.5.1.5	PCM-Voice Message	The PCM Voice message shall be encoded as illustrated in Figure 3-81 with the field descriptions shown in Table 3-12.	T	IPVM	
193	3.2.2.6.5.1.6	Radio Control Message	The Radio Control message shall be encoded as illustrated in Figure 3-82 with the field descriptions shown in Table 3-13.	T	IRCM	
194	3.2.2.6.5.1.6	Radio Control Message	The Radio Control message shall be segmented across the interface if the message exceeds the segmentation size, defined by the N1 parameter.	T	IRCM	
195	3.2.2.6.5.1.6	Radio Control Message	The Total Segment Count (TSC) field shall indicate one less than the total number of segments for a specific transaction (identified by the TID field).	T	IRCM	
196	3.2.2.6.5.1.6	Radio Control Message	The Segment Count (SC) field shall indicate the individual segment number for the transaction.	T	IRCM	
197	3.2.2.6.5.1.6	Radio Control Message	A message shall be deemed valid by the receiving unit, if all segments are received in sequence prior to the expiration of the T3 timer.	T	IRCM	
200	3.2.2.6.5.1.7	Radio Monitoring Message	The Radio Monitoring message shall be encoded as illustrated in Figure 3-82 with the field descriptions shown in Table 3-13.	T	IRMM	
201	3.2.2.6.5.1.7	Radio Monitoring Message	The Radio Monitoring message shall be segmented across the interface if the message exceeds the segmentation parameter, as defined by the N1 parameter.	T	IRMM	
202	3.2.2.6.5.1.7	Radio Monitoring Message	The TSC field shall indicate one less than the total number of segments for a specific transaction (identified by the TID field).	T	IRMM	
203	3.2.2.6.5.1.7	Radio Monitoring Message	The SC field shall indicate the individual segment number for the current transaction.	T	IRMM	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
204	3.2.2.6.5.1.7	Radio Monitoring Message	A message shall be deemed valid by the receiver, if all segments are received in sequence prior to the expiration of the T3 timer.	T	IRMM	
205	3.2.2.6.5.1.7	Radio Monitoring Message	Monitoring messages generated by the MDR as a result of an Alert of Alarm threshold crossing, shall set the RR and TID fields to 0.	T	IRMM	
208	3.2.2.6.5.1.8	RIU/MDR Status Message	The RIU/MDR Status message shall be encoded as illustrated in Figure 3-83 with the field descriptions shown in Table 3-15.	T	ILSM	
209	3.2.2.7	Physical Layer	The MDR/RIU interface shall implement the fractional T1 protocol as defined in ANSI T1.403-1995.	A	AT1P	
210	3.2.2.7.1.1 a)	T1 Frame Characteristics	A T1 frame shall consist of 193 bits.	T	ILLI	
211	3.2.2.7.1.1 b)	T1 Frame Characteristics	Each T1 frame shall be composed of one framing bit and twenty-four 8-bit time slots that carry data.	T	ILLI	
212	3.2.2.7.1.1 c)	T1 Frame Characteristics	The framing bit shall be the first bit of each frame.	T	ILLI	
213	3.2.2.7.1.1 d)	T1 Frame Characteristics	The twenty-four 8-bit slots shall be organized as described in Figure 3-84, T1 System Timing.	T	ILLI	
214	3.2.2.7.1.1 e)	T1 Frame Characteristics	The T1 line shall transmit at a rate of 8,000 T1 frames/s, resulting in a bit rate of 1.544 Mbit/s.	T	ILLI	
215	3.2.2.7.1.1 f)	T1 Frame Characteristics	The T1 line shall use Extended Super Frame (ESF) formatting consisting of groups of 24 consecutive T1 frames.	T	ILLI	
216	3.2.2.7.1.1 g)	T1 Frame Characteristics	The eighth bit of every time-slot in every sixth T1 frame shall be used for data.	T	ILLI	
217	3.2.2.7.1.1 h)	T1 Frame Characteristics	The ESF data link shall support the Line Loopback Activate/Deactivate and Payload Loopback Activate/Deactivate messages to support line diagnostics and maintenance.	A	AT1L	
218	3.2.2.7.1.1 i)	T1 Frame Characteristics	Pulse density shall be accomplished using the Bipolar 8-Zero Substitution (B8ZS) method.	T	ILLI	
219	3.2.2.7.1.2 a)	T1 Line Requirements	Each T1 port shall be able to operate over any cable length between 0 and 6,000 ft.	T	ITLR	
220	3.2.2.7.1.2 b)	T1 Line Requirements	Each T1 port shall incorporate transient protection.	A	AT1L	
221	3.2.2.7.1.2 c)	T1 Line Requirements	Each T1 port shall have a jitter tolerance that conforms to [ITU-T Recommendation G.824 (03/93), Section 3.1.1, Table 2].	A	AT1L	
222	3.2.2.7.1.3	T1 Time Slots	These slots shall be allocated according to the following subparagraph.	LL	None	Must meet ICD Shalls #226, 237, and 238.
223	3.2.2.7.1.3.1 a)	T1 Time Slot Assignments	Time slots one and two shall be used to carry information in a timing channel.	NT	None	RIU Function
224	3.2.2.7.1.3.1 b)	T1 Time Slot Assignments	Time slots three and four shall be unused, and designated as spares.	NT	None	RIU Function

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
225	3.2.2.7.1.3.1 c)	T1 Time Slot Assignments	The remaining time slots (5 through 24) in the T1 frame shall be organized into five data channels, each consisting of four contiguous T1 time slots.	NT	None	RIU Function
226	3.2.2.7.1.3.1 d)	T1 Time Slot Assignments	The default data channel shall be channel 1 (slots 5 - 8).	T	ITSA	
227	3.2.2.7.1.3.2 a)	Timing Channel	Timing shall be conveyed in the timing channel using a 16-bit counter that increments by one for each T1 frame.	NT	None	RIU Function
228	3.2.2.7.1.3.2 b)	Timing Channel	The first timing slot shall contain the low-order least significant byte (LSB) of the counter with the most significant bit of the byte transmitted/received first.	NT	None	RIU Function
229	3.2.2.7.1.3.2 c)	Timing Channel	The second timing slot shall contain the high-order most significant byte (MSB) of the counter with the most significant bit of the byte transmitted/received first.	NT	None	RIU Function
230	3.2.2.7.1.3.2 d)	Timing Channel	Bit 1 (least significant bit) of each HDLC message octet shall be the first bit transmitted over the Data Channel on the T1 line.	NT	None	RIU Function
237	3.2.2.7.1.3.3 b)	T1 Data Channels	Each data channel shall be capable of carrying data, control, monitoring and status information in the VDL Mode 3 and PCM Voice, control, monitoring and status information in the DSB-AM Mode.	T	ILLI	
238	3.2.2.7.1.3.3 c)	T1 Data Channels	Allocation of time slots to channels shall be fixed for all T1 frames on a given link (i.e., for as long as a channel is in use, it occupies the same time slot numbers in each T1 frame that is generated).	T	ILLI	
244	3.2.2.7.2 a)	System Timing	The leading edge of the framing bit shall be the point of reference for system timing.	NT	None	RIU Function
245	3.2.2.7.2 c)	System Timing	The leading edge of a framing bit of T1 frame shall coincide with the beginning of the VDL Mode 3 6-second epoch within plus or minus 10 microseconds.	NT	None	RUI Function
246	3.2.2.7.2 e)	System Timing	The start of the 6-second epoch shall coincide with the center of the first synchronization D8PSK symbol in LBAC 1 of slot A in the even TDMA frame of the first MAC cycle in the epoch, which is also –1260 D8PSK symbol periods relative to the MAC cycle “0” Timing Reference Point (TRP) as defined in the VDL Mode 3 RTCA DO-224a.	T	ISTC	
247	3.2.2.7.2 f)	System Timing	For Voice-Burst, Data-Burst and Management-Burst Messages, the TOT and TOA fields shall have a “0” reference point that corresponds to the center of the first D8PSK synchronization symbol in LBAC 1 of slot A in the even TDMA frame of the MAC cycle in which the burst is transmitted or received.	T	ISTC	
251	3.2.2.1.4.3.1.19	HDLC Channel Number (ID 19)	The bit format of the HDLC Channel Number parameter shall be encoded/decoded as indicated in Figure 3-21.	T	IMCP	
252	3.2.2.1.4.3.1.21	Squelch Enable/Disable (AM) (ID 21)	The bit format of the Squelch Enable/Disable parameter shall be encoded/decoded as indicated in Figure 3-23.	T	IMCP	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
253	3.2.2.1.4.3.1.32	Receiver Mute Level (AM) (ID 39)	The bit format of the Receiver Mute Level parameter shall be encoded/decoded as indicated in Figure 3-32.	T	IMCP	
254	3.2.2.1.4.3.1.33	Test PTT (AM) (ID 40)	The bit format of the Test PTT parameter shall be encoded/decoded as indicated in Figure 3-33.	T	IMCP	
255	3.2.2.1.4.3.2. 6	Threshold Setting (ID 6)	The bit format of the Threshold Setting parameter shall be encoded/decoded as indicated in Figure 3-41.	T	IMMP	
256	3.2.2.1.4.3.2.19	HDLC Channel Number (ID 19)	The bit format of the HDLC Channel Number parameter shall be encoded/decoded as indicated in Figure 3-54.	T	IMMP	
257	3.2.2.6.2.3	Link Clearing	Upon receipt of a valid TEST Response confirming the clear, the initiator shall clear the T1 timer, and both the MDR and RIU will be in the link inactive state.	T	ILCF	
258	3.2.2.6.5.1	General Message Structure	Unless otherwise specified in the remainder of this section, bit fields shall be encoded such that the most significant bit of a field (or sub-field that crosses octet boundaries) is in the highest bit number position of the octet.	T	IDBM/ILSM/IMBM /IPVM/IRCM/IRM M/ISCM/IVBM	
259	3.2.2.6.5.1	General Message Structure	For variable length bit fields that have a total length (LEN) that is not a multiple of 8, the most significant bit of the part-octet (remaining part of the field) at the end of the field shall be encoded in bit 8 of the last octet and ...	T	IDBM/ILSM/IMBM /IPVM/IRCM/IRM M/ISCM/IVBM	
260	3.2.2.6.5.1	General Message Structure	... the unused lower numbered bit(s) in the last octet shall be set to 0.	T	IDBM/ILSM/IMBM /IPVM/IRCM/IRM M/ISCM/IVBM	
261	3.2.2.6.5.1.1	Voice-Burst Message	The TOA/TOT field shall be the same value for all Voice-Burst message segments related to the same VDL Mode 3 voice burst.	T	IVBM	
262	3.2.2.6.5.1.1	Voice-Burst Message	VDL Mode 3 voice burst D8PSK symbols shall be mapped to Voice-Burst message VF octets as specified in Table 3-8a.	T	IVBM	
263	3.2.2.6.5.1.2	Data-Burst Message	The TOA/TOT field shall be the same value for all Data-Burst message segments related to the same VDL Mode 3 data burst.	T	IDBM	
264	3.2.2.6.5.1.2	Data-Burst Message	VDL Mode 3 data burst D8PSK symbols shall be mapped to Data-Burst message DF octets as specified in Table 3-8a.	T	IDBM	
265	3.2.2.6.5.1.3	Management-Burst Message	The MB field shall be encoded with the most significant bit of each VDL Mode 3 12-bit Management Burst word placed in the highest unused bit number position in the octet.	T	IMBM	
266	3.2.2.6.5.1.3	Management-Burst Message	As Management Burst words cross octet boundaries, the most significant bit of the remaining 12-bit Management Burst word shall be placed in bit 8 of the next octet.	T	IMBM	
267	3.2.2.6.5.1.4	Sync Search Control Message	The Synchronization Header Type (STYPE) field shall be encoded per Table 3-10a.	T	ISCM	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
268	3.2.2.6.5.1.4	Sync Search Control Message	The NGW field shall indicate the number of (24,12) Golay words in the received burst to be decoded by the MDR if synchronization is achieved within the search window.	T	ISCM	
269	3.2.2.7.2 g)	System Timing	For the Sync Search Control Message, the Sync Search Start (S_START) field shall define the earliest time within a VDL Mode 3 epoch where the center of the first D8PSK synchronization symbol in a receive burst may occur.	T	ISTC	
270	3.2.2.7.2 h)	System Timing	For the Sync Search Control Message, the Sync Search Stop (S_STOP) field shall define the latest time within a VDL Mode 3 epoch where the center of the first D8PSK synchronization symbol in a receive burst may occur.	T	ISTC	
271	3.2.2.7.2 i)	System Timing	... and shall have a range of 0 to 1, 007,999 within a 6-second VDL Mode 3 epoch.	T	ISTC	
272	3.2.2.1.4.3.1. 9	Squelch Audio Signal-to-Noise Level Setting	The bit format of the Squelch Audio Signal-to-Noise Level Setting parameter shall be encoded/decoded as indicated in Figure 3-11.	T	IMCP	
273	3.2.2.1.4.3.1.34	Public Key Maintenance (ID 41)	The bit format of the Public Key Maintenance parameter shall be encoded/decoded as indicated in Figure 3-34.	T	IMCP	
274	3.2.2.1.4.3.1.35	T2 (Link Retransmission Timer) (ID 42)	The bit format of the T2 parameter shall be encoded/decoded as indicated in Figure 3-35.	T	IMCP	
275	3.2.2.1.4.3.2. 9	Squelch Audio Signal-to-Noise Level Setting	The bit format of the Squelch Audio Signal-to-Noise Level Setting parameter shall be encoded/decoded as indicated in Figure 3-44.	T	IMMP	
276	3.2.2.1.4.3.2.24	Audio Input Level Setting (ID 31)	The bit format of the Audio Input Level Setting parameter shall be encoded/decoded as indicated in Figure 3-58.	T	IMMP	
277	3.2.2.1.4.3.2.27	MAC Timing Offset Correction (VDL Mode 3) (ID 34)	The bit format of the MAC Timing Offset Correction parameter shall be encoded/decoded as indicated in Figure 3-59.	T	IMMP	
278	3.2.2.1.4.3.2.28	Suppress Alarm/Alert Setting (ID 35)	The bit format of the Suppress Alarm/Alert Setting parameter shall be encoded/decoded as indicated in Figure 3-60.	T	IMMP	
279	3.2.2.1.4.3.2.29	Software Upload Setting (ID 37)	The bit format of the Software Upload Setting parameter shall be encoded/decoded as indicated in Figure 3-61.	T	IMMP	
280	3.2.2.1.4.3.2.32	Receiver Mute Level Setting (ID 39)	The bit format of the Receiver Mute Level Setting parameter shall be encoded/decoded as indicated in Figure 3-62.	T	IMMP	
281	3.2.2.1.4.3.2.33	PTT Setting (ID 40)	The bit format of the PTT Setting parameter shall be encoded/decoded as indicated in Figure 3-63.	T	IMMP	
282	3.2.2.1.4.3.2.34	Public Key List (ID 41)	The bit format of the Public Key List parameter shall be encoded/decoded as indicated in Figure 3-64.	T	IMMP	

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Shall #	Paragraph #	Paragraph Title	Requirement	Test Method	Test Case(s)	Remarks
283	3.2.2.1.4.3.2.35	T2 (Link Retransmission Timer) (ID 42)	The bit format of the T2 parameter shall be encoded/decoded as indicated in Figure 3-65.	T	IMMP	
284	3.2.2.1.4.3.2.43	Measured Power Output (ID 57)	The bit format of the Measured Power Output parameter shall be encoded/decoded as indicated in Figure 3-72.	T	IMMP	
285	3.2.2.1.4.3.2.44	Measured Transmitter Modulation % (58)	The bit format of the Measured Transmitter Modulation % parameter shall be encoded/decoded as indicated in Figure 3-73.	T	IMMP	
286	3.2.2.6.1.2	Address Field	For TEST Response messages, the AD field shall contain the address of the unit from which the information sequence in the frame is sent.	T	IDLL	
287	3.2.2.6.1.2.1 b)	RIU Address	The MDR shall encode the HDLC address as 01 for all HDLC UI messages to be delivered to the RIU.	T	IDLL	
290	3.2.2.6.1.3	Control Field	All Unnumbered Information (UI) frames shall be UI Command frames.	T	IDLL	
291	3.2.2.6.1.3	Control Field	The Poll/Final bit (bit 5) in the Control Field is not used and shall be set to 0.	T	IDLL	
292	3.2.2.6.5.1.6	Radio Control Message	If the MDR detects an error, it shall be reported back in the reply by setting the ER field to 1, and placing the error cause code in the first octet of the message (MSG) field.	T	IRCM	
293	3.2.2.7.2 i)	System Timing	The resolution of the TOA, TOT, S_START and S_STOP fields shall be 1/16th of a D8PSK symbol period and ...	T	ISTC	
294	3.2.2.1.4.3.1.22	ATR Switch Mode (ID=22)	The bit format of the ATR Switch Mode parameter shall be encoded/decoded as indicated in Figure 3-24.	T	IMCP	
295	3.2.2.1.4.3.2.22	ATR Switch Mode (ID 22)	The bit format of the ATR Switch Mode parameter shall be encoded/decoded as indicated in Figure 3-57.	T	IMMP	
296	3.2.2.6.1.2.2 a)	MDR Address	MDR transmitters shall encode the HDLC address as 02 for all HDLC Test Response messages to be delivered to the RIU.	T	IDLL	
297	3.2.2.6.1.2.2 b)	MDR Address	MDR receivers shall encode the HDLC address as 03 for all HDLC Test Response messages to be delivered to the RIU.	T	IDLL	
298	3.2.2.6.1.2.2 e)	MDR Address	MDR transmitters shall accept and process HDLC UI messages from the RIU with the HDLC address encoded as 02.	T	IDLL	
299	3.2.2.6.1.2.2 f)	MDR Address	MDR Receivers shall accept and process HDLC UI messages from the RIU with the HDLC address encoded as 03.	T	IDLL	
300	3.2.2.6.1.6	Inter Frame Time Fill	The time between frames shall be filled with flag characters, per ISO 3309.	T	IDLL	

APPENDIX B - OCT TEST CASE DESCRIPTIONS

This Appendix is divided into seven sections indexed as follows:

Appendix B1 - System Test Cases

System Test Descriptions: The System Test Cases will focus on validating requirements of the transmitters and receivers as they operate as part of the system. All System test cases apply to both the AM and VDL Mode 3 modes unless otherwise noted. The System test cases will also test the 15 watt and 50 watt transmitters unless otherwise noted. The following pages describe the System test cases in Figure 4.

1. SATR Objectives: The objective of the SATR test case is to determine the transmitters' ability to meet the antenna transfer relay requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	374*	T	FAA-E-2938	381	T
FAA-E-2938	375	T	FAA-E-2938	382	T
FAA-E-2938	376	T	FAA-E-2938	383	T
FAA-E-2938	377	T	FAA-E-2938	621*	T
FAA-E-2938	379	T	FAA-E-2938	677*	T

**DSB-AM operation covered by this test case. Also see test case AATR.*

2. SATR Test Criteria: The MDRs will pass the SATR test case if the following criteria are met:

   a. The transmitter leakage does not interfere with the receiver operation when the units are configured in the T/R configuration. The path during transmissions prevents signals stronger than –7 dBm from reaching the receiver. However, the ATR does provide sufficient leakage from the transmitter to allow the receiver to monitor if the transmitter is operating. (381, and 382)
   b. In the dynamic mode and when the antenna is in use by the local MDR (actively transmitting), the ATRC (common) connector input is routed to the ATR2 connector. (376)
   c. In the dynamic mode and when the antenna is not in use by the local MDR, the ATRC (common) connector input is routed to the ATR1 connector. (377)
   d. The default path is from ATRC to ATR1. (379)
   e. The ATR function supports operation of two MDR units to a single antenna in both DSB-AM in the following configurations: T/R and T/T. (374 and 375)
   f. The ATR has a maximum allowable loss of 1dB. (621)
   g. In the T/T configuration, the ATR provides sufficient isolation between the ATR1 and ATR2 connector paths to prevent damage to the non-radiating transmitter. (383)
   h. The ATR Switch shall not degrade: (677)
      1) Performance of the transmitter connected directly to the antenna;
      2) Performance of the transmitter connected to the antenna through its ATR switch;
      3) Performance of a second transmitter connected to the antenna through the ATR switch;
      4) Performance of the receiver connected to the antenna through the ATR switch, except as specified in Section 3.2.2.2.14n.

3. SATR Test Approach: The following approaches will be used:

a. Transmit/Receive Configuration. The transmitter will be tuned to a high frequency and keyed. The output power (MDR RF port) of the transmitter will be measured and recorded (part of Shall 621)(677(1)). The Transmitter MDR RF will be connected to the transmitter ATR2 port with the transmitter and receiver in the T/R configuration illustrated in FAA-E-2938, Figure 6-3. The transmitter output port will be monitored when the transmitter is keyed (less than 1 dB of loss, part of Shall 621) (677(2)) (376). The RF level from the transmitter ATR1 port that reaches the receiver MDR port will be recorded (>-102 dBm (382) and <-7 dBm (381)). Next, a signal will be inserted into the ATRC port when the transmitter is not keyed (377). First it will be verified that the signal passes through to the receiver MDR port with less than 1 dB of loss (part of Shall 621)(677(4)). Next the power will be removed from the MDR transmitter and the signal will be re-verified (379).

b. Transmit/Transmit Configuration. The transmitters (main and standby) will be tuned to a high frequency. The output power (MDR RF port) of the second transmitter (standby) will be measured and recorded (part of Shall 621)(677(1)). The second transmitter MDR RF will be connected to the first transmitter ATR1 port with the transmitters in the T/T configuration illustrated in FAA-E-2938, Figure 6-4. The first transmitter output port (ATRC) will be monitored when the second transmitter is keyed (less than 1 dB of loss, part of Shall 621)(677(3)). The first transmitter (main) will be keyed and output verified that operation is unaffected by RF power from the second transmitter (standby) in the T/T configuration (first transmitter unaffected, 383). Next the second transmitter will be keyed and output verified that operation is unaffected by RF power from the first transmitter (main) in the T/T configuration (second transmitter unaffected, 383).

The following requirements in will be evaluated by completing the above tests: FAA-E-2938, Shall #374 and 375.

4. SATR Data Analysis Methods: The requirements will be analyzed through the use of a spectrum analyzer, audio analyzer, RF power meter, RF signal generator, oscilloscope, and an MDT.

1. SYAC Objectives: The objective of the SYAC test case is to verify that the MDRs meet the AC input power requirements for harmonics, inrush current, and power factor. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	332 through 336	T			

2. SYAC Test Criteria: The receiver and transmitter(s) will pass the SYAC if they meet the following conditions:

a. The MDR's total harmonic distortion of its input current (in any of the MDR configurations) does not exceeding 5% of the fundamental AC power line frequency (60 Hz) and no single harmonic exceeds 3%. (332 and 333)
b. The MDR's inrush current characteristics do not exceed 1.5 times the overcurrent shown in the FAA-E-2938, Figure 3-3, (in any of the MDR configurations). The duration of the inrush current will be measured from the point at which the power is turned on to the point to which the current returns within 110% of its normal value. (334 and 335) Note: Reference FAA-G-2100, Section 3.1.1.2.2. It is assumed the MDR load does not exceed 600 watts.
c. The MDR's present a power factor to the AC power source of not less than 0.7 leading or lagging when operating under steady state conditions, from 25% to 100% of full load at the nominal line voltage (120VAC) and under any MDR configuration. (336) *Note: See FAA-G-2100, Section 3.1.1.2.1.*

3. SYAC Test Approach: Using System Test Setup #1, the AC/DC power requirements for the receiver and transmitter(s) will be measured during the execution of selected requirement tests. The AC harmonic content, feedback into the AC power source, and the AC power factor will be measured and recorded during the execution of selected receiver and transmitter performance tests. During equipment power-up, the AC in-rush current magnitude and duration will be measured.

4. SYAC Data Analysis Methods: The requirements will be analyzed through the use of a storage scope, power analyzer, oscilloscope and a programmable AC/DC power supply. A lab automation computer running LabWindows© will control the test equipment. Data will be collected and stored on the lab computer hard drive for later analysis.

1. SYIP Objectives: The objective of the SYIP test case is to verify that the MDRs meet the input power requirements for both AC and DC operation. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	316 through 320	T	FAA-E-2938	684	T
FAA-E-2938	322	T	FAA-E-2938	685	T
FAA-E-2938	325	T	FAA-E-2938	700	T

2. SYIP Test Criteria: The receiver and transmitter(s) will pass the SYIP if they meet the following conditions:

a. The MDR meets all of the requirements of the FAA-E-2938 with primary line input voltage of 120 VAC (±10%), 60 Hz (±3 Hz) single phase and with an alternate line input voltage of 24 VDC, negative ground, (-10/+20%). (316) *Note: normal test operation will be under AC, however some tests will be run under DC power.*
b. The MDR contains an internal automatic line voltage switchover in case of the loss of primary AC line input voltage (or non-availability of AC voltage) and activation of this switchover allow for operation from a DC voltage source. (317 and 318)
c. The MDR operates under varying conditions, such as slow variations of AC and DC line voltages and AC line frequency, within the ranges specified in the FAA-E-2938. (319)
d. The MDR resumes normal operation when subjected to power interruptions and/or outages in accordance with FAA-G-2100, Section 3.1.1.8. (320)
e. The MDR has normal operation at AC/DC input currents at or below the limits listed in Table 3-6 of the FAA-E-2938. (322)
f. The MDR incorporates reverse polarity protection to prevent damage to the MDR equipment if the polarity of the 24 VDC input voltage is reversed. (325)
g. If both AC and DC power are not available to the MDR, the MDR operates off of the power source selected by the Primary Power Source Switch. (700)
h. Automatic switching between power sources in the event of power loss of one power source occurs regardless of the primary power source selection. (684)
i. Manual or automatic switching between power sources does not interrupt MDR operation nor degrade MDR performance. (685)

3. SYIP Test Approach: Using System Test Setup #1, the AC/DC input power requirements for the receiver and transmitter will be measured during the execution of selected tests. The source voltage will be varied according to Section 3.4.2.1 of FAA-E-2938. The maximum current draw will be recorded and measured. The operation of the internal switchover will be tested and the DC input voltage polarity of the UUT will be reversed to test for possible damage to the MDR. To verify the DC operation of the MDRs, they will be functionally tested under DC power (i.e. turned on, transmitter power output verified and receiver sensitivity verified.)

4. SYIP Data Analysis Methods: The requirements will be analyzed through the use of a RF power meter, RF signal generator, oscilloscope and a programmable AC/DC power supply. A lab automation computer running LabWindows© will control the test equipment. Data will be collected and stored on the lab computer hard drive for later analysis.

1. SYLV Objectives: The objective of the SYLV test case is to verify that the MDRs will be damaged by a loss of input power. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	344	T			

2. SYLV Test Criteria: The MDR does not suffering any damage to its components or other interfacing equipment due to a loss or variance of input voltage, including loss of voltage caused by activation of circuit protector devices. (344)

3. SYLV Test Approach: The MDR units will be powered and aligned. Normal operation of the MDR units will be verified. Input voltage to the MDR units will be varied beyond what is stated in Section 3.4.2.1 of FAA-E-2938. Input voltage will then be returned to values stated in Section 3.4.2.1 of FAA-E-938. Finally, normal operation of the MDR units will be verified.

4. SYLV Data Analysis Methods: The MDRs will be analyzed through the use of a spectrum analyzer, audio analyzer, RF power meter, RF signal generator, oscilloscope and a programmable AC/DC power supply. A lab automation computer running LabWindows© will control the test equipment. Data will be collected and stored on the lab computer hard drive for later analysis.

1. SYSC Objectives: The objective of the SYSC test case is to verify the circuit protection capabilities of the MDRs. The following requirements will be evaluated by this test case:

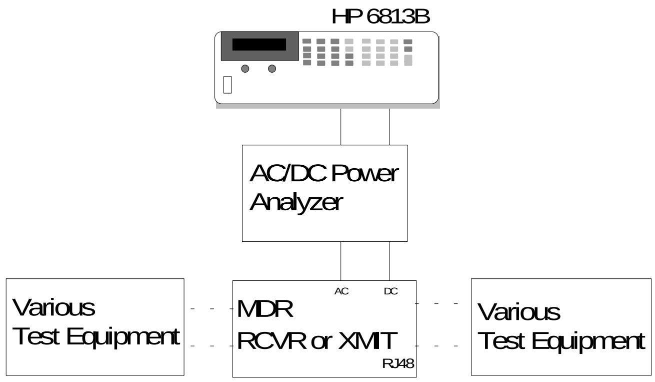
Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	326	T	FAA-E-2938	327	T

2. SYSC Test Criteria: The receiver and transmitter(s) will pass the SYSC if they meet the following conditions:

a. The MDR's input/output circuits are designed to include circuit protection, which prevents opens or shorts at the input/output terminals from damaging the equipment. (326)
b. When the short or open is removed, the MDR shows no sign of performance degradation in accordance with FAA-G-2100, Section 3.1.1.7. (327)

3. SYSC Test Approach: The MDR units will be powered and normal operation will be verified for the unit. Selected input and output circuits will be subjected to short and open circuits. The short and open circuits will be removed and normal operation of the MDR units will be verified.

4. SYSC Data Analysis Methods: The MDRs will be analyzed through the use of a spectrum analyzer, audio analyzer, RF power meter, and an RF signal generator. A lab automation computer running LabWindows© will control the test equipment. Data will be collected and stored on the lab computer hard drive for later analysis.



System Test Setup #1

AC/DC Power Tests SYAC and SYIP

APPENDIX B2 - RECEIVER TEST CASES

DSB-AM Receiver Test Description: The DSB-AM Receiver Test Cases will focus on validating the receiver characteristics for the DSB-AM mode. Emphasis will be placed on verifying the listed requirements utilizing 25 kHz channel spacing. The following pages describe the DSB-AM mode receiver test cases identified in Figure 5.

1. RAAC Objectives: The objective of the RAAC test is to validate the audio output signal control and level regulation capabilities of the receiver. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	48**	T	FAA-E-2938	217*	T
FAA-E-2938	49	T	FAA-E-2938	368	T
FAA-E-2938	50	T			

**Only partially verified by this test case. Also see Test Cases RAIF*
***Only partially verified by this test case. Also see Test Cases DMCP.*

2. RAAC Test Criteria: The receiver will successfully pass the RAAC test case if:

   a. With an RF input consisting of a -87 dBm carrier AM modulated 30% with a 1004 Hz tone, the audio output level of the MDR receiver shall be adjustable between -25 dBm and +20 dBm in 0.5dB steps. (48) *Note: The 0.5dB step size will be verified in Test Case DMCP.*
   b. With the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –87dBm and the receiver's audio output adjusted to produce a +20dBm output level, the receiver's audio output does not vary more than +/-1.0 dB as the modulation is increased to 100%. (49)
   c. With the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –87dBm and the receiver's audio output adjusted to produce a +20 dBm output level, as the receiver audio output's load resistance is reduced from 600 ohms to 120 ohms, the audio level does not drop more than 4.0 dB. (50 and 217)
   d. With the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –87dBm, the receiver's front panel headphone jack audio level is continuously adjustable over the range of +20dBm thru –25dBm. (368)

3. RAAC Test Approach: Receiver Test Setup #1. With the undesired signal switched off. The desired signal generator will be set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –87dBm (49). The receiver's audio output will be varied over its adjustment range to determine limits (48). Then the receiver's audio output will be set to provide a +20dBm (600Ω) level. The receiver's audio output power level will be monitored as the modulation is increased from 30% to 100% and as the output load resistance is reduced to 120 ohms (50). Additionally, the front panel headphone jack audio will be measured over its entire adjustment range (368).

By virtue of conducting the above tests, the requirement for FAA-E-2938 Shall #217 voice audio impedance will be verified.

4. RAAC Data Analysis Methods: The results will be checked against the requirements and logged.

1. RAAD Objectives: The objective of the RAAD test is to measure the total distortion of the receiver's audio output. The following requirement will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	59*	T			

**Only the main audio distortion will be verified, not the local audio output distortion.*

2. RAAD Test Criteria: The receiver will successfully pass the RAAD test case if:

   a. With the desired signal generator set to produce an AM signal modulated 30% at an RF level of –67dBm and the receiver's audio output adjusted to produce a +20dBm output level, the modulating frequency will be varied from 300Hz to 3000Hz. The receiver's main audio output has a distortion of not more than 2.0% over this modulating frequency range. (59)
   b. With the desired signal generator set to produce an AM signal modulated 90% at an RF level of –67dBm and the receiver's audio output adjusted to produce a +20dBm output level, the modulating frequency will be varied from 300Hz to 3000Hz. The receiver's main audio output has a distortion of not more than 5.0% over this modulating frequency range. (59)
   c. With the desired signal generator set to produce an AM signal modulated 30% at an RF level of –27dBm and the receiver's audio output adjusted to produce a +20dBm output level, the modulating frequency will be varied from 300Hz to 3000Hz. The receiver's main audio output has a distortion of not more than 2.0% over this modulating frequency range. (59)
   d. With the desired signal generator set to produce an AM signal modulated 90% at an RF level of –27dBm and the receiver's audio output adjusted to produce a +20dBm output level, the modulating frequency will be varied from 300Hz to 3000Hz. The receiver's main audio output has a distortion of not more than 5.0% over this modulating frequency range. (59)

3. RAAD Test Approach: Using Receiver Test Setup #1, with the undesired signal switched off. The desired signal generator will be setup to produce a signal with a modulation index either 30% or 90%, RF level between –27 dBm to –67 dBm and modulation frequency between 300Hz to 3000Hz. The receiver's main audio output will be tested over its entire range. Under the above conditions, the distortion level of the receiver's demodulated main audio output will be measured. This test will be repeated at three RF frequencies: a low, mid, and high portion of the band.

4. RAAD Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirement and logged within the controlling computer.

1. RAAS Objectives: The objective of the RAAS test is to determine if the receiver meets the AGC stabilization requirements for DSB-AM mode. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	92	T	FAA-E-2938	93	T

2. RAAS Test Criteria: The receiver will successfully pass the RAAS test case if:

   a. With the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –92dBm, the receiver's audio output produces a SINAD of not less than 10dB within no more than 20 milliseconds of the addition of an undesired +14 dBm CW signal that is +/-2MHz offset from the desired. (92)
   b. With the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –92dBm and an undesired +14 dBm CW signal that is +/-2MHz offset from the desired, the receiver's audio output produces a SINAD of not less than 10dB within no more than 150 milliseconds of the undesired signal being switched off. (93)

3. RAAS Test Approach: Receiver Test Setup #1. The desired signal generator will be set to evaluate sensitivity as outlined above. The Undesired signal generator will be set to produce a +14 dBm unmodulated signal +/- 2MHz away from the desired carrier. The audio output of the receiver will be monitored as the undesired signal is turned on and again as the undesired signal is turned off. (92 and 93)

4. RAAS Data Analysis Methods: Under the above test conditions, a digital oscilloscope will be queried, and the audio distortion measured. The results will be checked against the requirements and logged within the controlling computer.

1. RACM Objectives: The objective of the RACM test is to determine the cross modulation characteristics of the receiver. The following requirement will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	43	T			

2. RACM Test Criteria: The receiver will successfully pass the RACM test case if, for an on-channel signal (modulated 30% 1004 Hz tone) adjusted to produce a 10.0 dB SINAD ratio, the receiver produces not less than 8.0 dB SINAD ratio in the presence of an off-channel signal modulated 30% at 400 Hz as defined below: (43)

1. For an off-channel signal separated from the desired on-channel signal by ± 0.5 MHz, the level is at least 70.0 dB above the desired signal.
2. For an off-channel signal separated from the desired on-channel signal by ± 1.0 MHz, the level is at least 75.0 dB above the desired signal.
3. For an off-channel signal separated from the desired on-channel signal by ± 1.5 MHz, the level is at least 80.0 dB above the desired signal.

3. RACM Test Approach: Receiver Test Setup #1. The desired signal generator will be set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –87dBm. The undesired signal generator will be set to produce an AM signal modulated 30% with a 400Hz tone. The frequency separation of the two signals will be as described in one of the three separation conditions listed above. The SINAD at the receiver's audio output will be measured. This test will be repeated at three RF frequencies: a low, mid, and high portion of the band. This will also be repeated for each of the three separation conditions.

4. RACM Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirement and logged within the controlling computer.

1. RACO Objectives: The objective of the RACO test is verify the receiver's ability to reject signals from collocated transmitters in both fixed tuned and remotely tuned configurations. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	77	T	FAA-E-2938	390	T
FAA-E-2938	389	T			

2. RACO Test Criteria: The receiver will successfully pass the RACO test case if:

   a. While in a fixed tuned configuration or remotely tunable configuration, with the desired signal generator set to produce an AM signal modulated 30% with a 1004Hz tone at an RF level of -92dBm (-86dBm in the remotely tunable configuration) and with an undesired AM signal offset from the desired by +/-0.5MHz, modulated 90% with a 400 Hz tone at an RF level of 0dBm (15 watts carrier-42dB antenna isolation) the receiver's audio output produces a SINAD of not less than 10dB. (77)
   b. While in a fixed tuned configuration or remotely tunable configuration, with the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –92dBm (-86dBm in the remotely tunable configuration) and with an undesired VDL Mode 3 signal offset from the desired by +/-0.5MHz, with all four slots active at an RF level of 0dBm (15 watts-42dB antenna isolation) the receiver's audio output produces a SINAD of not less than 10dB. *Note: the SINAD will be measured only at those points where the interfering VDL burst is present, not averaged over the entire TDMA cycle.*
   c. While in a fixed tuned or remotely tunable configuration with the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –92dBm (–72dBm in the remotely tunable configuration) and with an undesired AM signal offset from the desired by +/-2MHz, modulated 90% with a 400 Hz tone at an RF level of +14dBm (15 watts carrier-28dB antenna isolation) the receiver's audio output produces a SINAD of not less than 10dB.
   d. While in a fixed tuned or remotely tunable configuration with the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –92dBm (–72dBm in the remotely tunable configuration) and with an undesired VDL Mode 3 signal offset from the desired by +/-2MHz, with all four slots active at an RF level of +14dBm (15 watts-28dB antenna isolation) the receiver's audio output produces a SINAD of not less than 10dB. Note: the SINAD will be measured only at those points where the interfering VDL burst is present, not averaged over the entire TDMA cycle.

3. RACO Test Approach: Receiver Test Setup #1. The desired signal generator will be set to produce an AM signal modulated 30% with a 1004 Hz tone at the RF level in accordance with the criteria above. The undesired signal generator will be set to produce a signal in accordance with the criteria above. While these signals are present at the receiver's RF input, the sensitivity will be monitored. This test will be repeated at three RF frequencies: a low, mid, and high portion of the band. This test will also be repeated for each of the conditions listed in the criteria above.

4. RACO Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RACP Objectives: The objective of the RACP test is to determine the receiver's frequency capture range capabilities in DSB-AM. The following requirement will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	369	T			

2. RACP Test Criteria: The receiver will successfully pass the RACP test case if the sensitivity requirement of FAA-E-2938, Section 3.2.2.1.3 is met with a maximum frequency offset of ± 885 Hz from nominal for air/ground communications. (369)

3. RACP Test Approach: Receiver Test Setup #1. The desired signal generator will be set to evaluate the sensitivity requirements of test case RASN. The undesired signal generator will be switched off. The frequency of the desired signal will be offset ±885 Hz while the output SINAD is monitored.

4. RACP Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirement and logged within the controlling computer.

1. RACR Objectives: The objective of the RACR test is to determine the receiver's ability to reject adjacent channel signals. The following requirement will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	80	T			

2. RACR Test Criteria: The receiver will successfully pass the RACR test case if:

   a. With the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –99dBm and with an undesired signal at +/-25kHz from the desired, modulated 90% with a 400 Hz tone at an RF level of –65dBm, the receiver's audio output produces a SINAD of not less than 10dB. (80)

3. RACR Test Approach: Receiver Test Setup #1. The desired signal generator will be set to evaluate the sensitivity requirements of test case RASN. The undesired signal generator will be set to provide an AM signal modulated 90% with a 400Hz tone at –65dBm that is offset +/-25 kHz from the desired. The receiver's audio output SINAD level will be recorded under these conditions. This test will be repeated at three RF frequencies: a low, mid, and high portion of the band.

4. RACR Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirement and logged within the controlling computer.

1. RADR Objectives: The objective of the RADR test is to determine the dynamic range characteristics of the receiver. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	85	T	FAA-E-2938	86	T

2. RADR Test Criteria: The receiver will successfully pass the RADR test case if:

   a. With the desired signal at the signal generator set to produce an AM signal modulated 90% with a 1004 Hz tone and an RF level varying between –7dBm and –102dBm into the receiver RF input, a SINAD of 10dB or greater is achieved. (85)
   b. With the desired signal generator set to produce an AM signal modulated 90% with a 1004 Hz tone and an RF level of +13dBm, the receiver must not be blocked. Blocking is defined as a 3dB reduction in the audio level referenced to the audio level setting at the desired signal input of –7dBm modulated 90% with a 1004 Hz tome. (86)

3. RADR Test Approach: Receiver Test Setup #1. The undesired signal generator will be switched off. The desired signal generator will be set to produce an AM signal modulated 90% with a 1004 Hz tone at an RF level of –102dBm. The receiver's audio output level will be recorded under these conditions. The desired signal will next be increased in level up to –7dBm. The receiver's audio SINAD will be monitored (85). The receiver's audio output level with and RF input of –7dBm will be measured, then the RF level will be increased to +13dBm. The audio output level achieved with the +13dBm signal will be recorded (86).

This test will be repeated at three RF frequencies: a low, mid, and high portion of the band.

4. RADR Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RAFR Objectives: The objective of the RAFR test is to determine the level stabilization and frequency response characteristics of the receiver. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	51	T	FAA-E-2938	60 through 63*	T

**Only the main audio output will be verified, not the local audio output (for all four requirements).*

2. RAFR Test Criteria: The receiver will successfully pass the RAFR test case if:

   a. With the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –50dBm, the receiver's audio output will be recorded as a reference level. As the desired signal is adjusted from an RF level of –95dBm to –7dBm, the receiver's audio output does not vary more than +/-3dB from the reference level. (51)
   b. With the desired signal generator set to produce an AM signal modulated 90% with a variable tone at an RF level of –102dBm, the modulating source will be swept from 100Hz to 10kHz. The receiver's main audio output does not vary more than +/-2dB within the modulating frequency range of 300Hz – 3000Hz. The receiver's main audio output level decreases at frequencies above 3000Hz, and is down at least 20dB at 10kHz. The receiver's main audio output level decreases at frequencies below 300Hz, and is down at least 10dB at 100Hz. This will be repeated for desired signal levels of –50dBm and –7dBm. (60, 61, 62, and 63)

3. RAFR Test Approach: Receiver Test Setup #1. The undesired signal generator will be switched off. The desired signal generator will be setup to produce an AM signal modulated 30% with a 1004Hz tone with an RF level of –50dBm. The receiver's audio output resulting from this signal will be adjusted to –8dBm and will be used as a reference. The desired signal generator's level will then be varied between –7dBm and –102dBm. The modulating frequency will also be swept from 100Hz to 10kHz. The receiver's audio output level will be recorded under these conditions. This test will be repeated at three RF frequencies: a low, mid, and high portion of the band.

4. RAFR Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RAIF Objectives: The objective of the RAIF test is to inspect and test the features of the receiver audio interfaces for the front panel headset and the rear audio and signal connections to/from external equipment. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	30	T	FAA-E-2938	217*	T
FAA-E-2938	32	T			

**Only partially verified by this test case. Also see Test Case RAAC.*

2. RAIF Test Criteria: The receiver will successfully pass the RAIF test case if the following conditions are met:

a. The impedance of the main output connector is measured and is between 540Ω and 660Ω (600Ω +/- 10%). (30)
b. The headset/headphone jack's audio level is controllable from the front panel of the receiver independently from the main audio output level control. (32)
c. The Receiver Mute signal is 0VDC ± 1V. Ground is the Muted condition and Open is the No Mute condition.(217)
d. The receiver Mute Confirmation is a dry contact closure. (217)
e. The receiver Squelch Break is a dry contact closure. (217)

3. RAIF Test Approach: Receiver Test Setup #1. The undesired signal generator will be switched off. The desired signal generator will be set to produce a 30% AM signal at an RF level of –87dBm at 118MHz. Under these conditions, the audio output level of the receiver will be measured with both an open circuit and a 600 ohm load. (30)

The desired signal generator will produce a signal at the receiver's RF input. The headset/headphone jack's audio level will be varied from the front panel control. (32) The main audio output level will be monitored (32) to ensure it is not varied as the front panel level is adjusted. Then the main audio output level will be adjusted via the MDT. The headset/headphone jack's audio level will be monitored (32) to ensure it is not varied as the main audio output level is adjusted.

Mute Assertion

- The Mute input pull-up/source voltage (<40 VDC) of the MDR receiver will be measured with a voltmeter at the Mute ground signals of the OCT Test Bed. (217)
- A ground signal from the MDR will be used to apply the Mute assertion (ground), and Muting current (<10 mA) will be measured with an amp meter in-series with the Mute signal of the OCT Test Bed. (217)
- The Mute ground voltage (0 VDC) will be varied ± 1V and will be applied to the Mute input of the OCT Test Bed to verify the ability of the MDR to Mute. (217)

Confirmations (Mute and Squelch Break)

- With no signal present (Mute or Squelch Break), each contact of the respective Confirmation signal will be measured with an ohmmeter to signal ground (open) and each other (open). (217)
- With a signal present (Mute asserted and Squelch Break active), each contact of the associated confirmation signal will be measured with an ohmmeter to signal ground (open) and each other (closed). (217)

4. <u>RAIF Data Analysis Methods</u>: The results of the above tests will be checked against the requirements and logged.

1. RAIM Objectives: The objective of the RAIM test is to verify the receiver's ability to reject intermodulation signals. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	41*	T	FAA-E-2938	42*	T

**Only partially verified by this test case. Also see RVIM.*

2. RAIM Test Criteria: The receiver will successfully pass the RAIM test case if:

   a. With two interfering signals set to –5dBm, FM modulated with a 400Hz tone at 75kHz deviation, in the band of 87.5MHz – 107.9MHz such that a 3rd order product falls directly under the receiver's desired frequency; the audio output of the receiver is measured to have a SINAD of at least 7dB. (41)
   b. With the two interfering signals set to –30dBm, 90% AM modulated with a 400Hz tone according to the frequency separation criteria below, the audio output of the receiver is measured to have a SINAD of at least 7dB. (42)

Desired Frequency	Undesired frequency 1	Undesired frequency 2
X	X-2MHz	X-4MHz
X	X+2MHz	X+4MHz

3. RAIM Test Approach: Receiver Test Setup #2. With the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –102dBm. The two interfering generators will be set to produce signals as indicated in the criteria above. With these three signals present at the receiver's RF input, the sensitivity will be measured. This test will be repeated at three RF frequencies: a low, mid, and high portion of the band.

4. RAIM Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RAOV Objectives: The objective of the RAOV test is to verify the receiver's ability to reject out of band signals. The following requirement will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	82	T			

2. RAOV Test Criteria: The receiver will successfully pass the RAOV test case if:

   a. With the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –100dBm and with an undesired unmodulated carrier in the frequency range 50kHz – 1215MHz (excluding the range 111.950-137.025 MHz) at –4dBm, the receiver's audio output produces a SINAD of not less than 10dB. (82)

3. RAOV Test Approach: Receiver Test Setup #1. The desired signal generator will be set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –100dBm. The undesired signal generator will set to produce a signal in accordance with the criteria above. The receiver's audio output SINAD level will be recorded under these conditions. This test will be repeated at three RF frequencies: a low, mid, and high portion of the band.

4. RAOV Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirement and logged within the controlling computer.

1. RASN Objectives: The objective of the RASN test is to verify that the receiver meets the DSB-AM sensitivity and internal noise requirements. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	37*	T	FAA-E-2938	367	T
FAA-E-2938	94	T	FAA-E-2938	679	T

**Only the main audio output will be verified, not the local audio output.*

2. RASN Test Criteria: The receiver will successfully pass the RASN test case if:

   a. With the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –102dBm, the main audio output of the receiver have a measured SINAD of at least 10dB. (37)
   b. With the desired signal generator set to produce an AM signal modulated 30% with a 1004 Hz tone at an RF level of –85dBm and no undesired signal, the receiver's main audio output produces a SINAD of at least 25dB. (94)
   c. The above criteria apply for both the fixed tuned and remotely tuned configurations
   d. The MDR receiver RF input shall have a 50 ohm characteristic impedance. (367)

3. RASN Test Approach: Receiver Test Setup #1. The undesired signal generator will be switched off. The desired signal generator will be set to produce an AM signal modulated 30% with a 1004 Hz tone at RF levels of –102dBm and –85dBm (50Ω). The receiver's audio output SINAD level will be recorded under these conditions. This test will be repeated at three RF frequencies: a low, mid, and high portion of the band. The receiver's audio output will be set to a nominal value of –8dBm into a 600Ω load.

By virtue of completing the above tests, the 50 ohm RF input capability will be verified.

4. RASN Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RASQ Objectives: The objective of the RASQ test is to determine the receiver's squelch characteristics. This includes sensitivity and hysteresis characteristics. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	66*	T	FAA-E-2938	74	T
FAA-E-2938	73	T			

**Only the main audio output will be verified, not the local audio output.*

2. RASQ Test Criteria: The receiver will successfully pass the RASQ test case if:

   a. The audio level associated with the change from "squelched" to "unsquelched" does not exceed a level 20dB below the alignment level at the main audio output. (66)
   b. The squelch attack time does not exceed 10ms. (73)
   c. The squelch release time does not exceed 35ms. (74)

3. RASQ Test Approach: The desired signal generator will be set to produce an AM signal modulated 30% with a 1004 Hz tone. The desired RF will be alternatively applied and removed while the receiver's audio output is monitored (66). The squelch attack and release times will also be measured. (73 and 74)

4. RASQ Data Analysis Methods: The results will be checked against the requirements and logged.

<u>VDL Mode 3 Receiver Test Description</u>: The VDL Mode 3 Receiver Test Cases will focus on validating the receiver characteristics during VDL Mode 3 operation. The following pages describe the VDL Mode 3 receiver test cases identified in Figure 5.

1. RVCC Objectives: The objective of the RVCC test case is to determine the receiver's ability to reject co-channel interference in VDL Mode 3. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	33*	T	FAA-E-2938	90	T

**Partially verified by this test case. All applicable test cases are: RVCC, RVCO, RVCP, RVCR, RVDR, RVIM, RVOV, and RVSN*

2. RVCC Test Criteria: The receiver will successfully pass the RVCC test case if:

   a. The uncorrected BER requirement under a co-channel interference condition is achieved when a ratio of wanted to unwanted signal of at most 20dB is applied at the receiver RF input. The co-channel interference protection will be measured using a VDL Mode 3 at a desired signal level of -90 dBm. (90)
   Note: The interfering signal will be a continuous D8PSK waveform modulated with a pseudo-random sequence. The symbol rate clocks of the desired and the interfering signal will differ by at least 1 ppm. The pseudo-random sequences used for the desired and undesired signal is different lengths and the ratio of lengths will not be an integer. The difference of 1 ppm in symbol rate clocks between the desired and interfering signals will guard against continual bit alignment between desired and undesired signals that could lead to non-repeatable BER measurements.

3. RVCC Test Approach: Receiver Test Setup #1. The desired signal generator will be set to produce a VDL Mode 3 signal using a known data pattern at an RF level of -90dBm. The interfering signal will be a continuous D8PSK waveform modulated with a pseudo-random sequence. The symbol rate clocks of the desired and the interfering signal will differ by at least 1 ppm. The pseudo-random sequences used for the desired and undesired signal is different lengths and the ratio of lengths will not be an integer. The difference of 1 ppm in symbol rate clocks between the desired and interfering signals will guard against continual bit alignment between desired and undesired signals that could lead to non-repeatable BER measurements. The interfering signal level will be set 20dB below the desired signal. The receiver's uncorrected digital output will be recorded and compared to the known input bit pattern to produce a bit error rate.

4. RVCC Data Analysis Methods: Under the above test conditions, a bit error rate analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RVCO Objectives: The objective of the RVCO test case is verify the receiver's ability to reject signals from collocated transmitters in both fixed tuned and remotely tuned configurations. The following requirement will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	33*	T	FAA-E-2938	387	T
FAA-E-2938	75	T	FAA-E-2938	388	T

**Partially verified by this test case. All applicable test cases are: RVCC, RVCO, RVCP, RVCR, RVDR, RVIM, RVOV, and RVSN*

2. RVCO Test Criteria: The receiver will successfully pass the RVCO test case if the following conditions are met:

a. While in a fixed tuned or remotely tunable configuration, with the desired signal generator set to produce a VDL Mode 3 signal using a known data pattern at an RF level of –92dBm (–86dBm in remotely tunable configuration) and with an undesired AM signal offset from the desired by +/-0.5MHz, modulated 90% with a 400 Hz tone at an RF level of 0dBm (15 watts carrier-42dB antenna isolation) the BER of the receiver is measured to be in equal to that achieved with test case RVSN. (75)
b. While in a fixed tuned or remotely tunable configuration, with the desired signal generator set to produce a VDL Mode 3 signal using a known data pattern at an RF level of –92dBm (–86dBm in remotely tunable configuration) and with an undesired VDL Mode 3 signal offset from the desired by +/-0.5MHz, with all 4 slots active and time synchronized to the desired at an RF level of 0dBm (15 watts-42dB antenna isolation) the BER of the receiver is measured to be in equal to that achieved with test case RVSN. (75)
c. While in a fixed tuned or remotely tunable configuration, with the desired signal generator set to produce a VDL Mode 3 signal using a known data pattern at an RF level of –92dBm (–86dBm in remotely tunable configuration) and with an undesired AM signal offset from the desired by +/- 2MHz, modulated 90% with a 400 Hz tone at an RF level of +14dBm (15 watts carrier-28dB antenna isolation) the BER of the receiver is measured to be in equal to that achieved with test case RVSN. (75)
d. While in a fixed tuned or remotely tunable configuration, with the desired signal generator set to produce a VDL Mode 3 signal using a known data pattern at an RF level of –92dBm (–86dBm in remotely tunable configuration) and with an undesired VDL Mode 3 signal offset from the desired by +/-2MHz, with all 4 slots active and time synchronized to the desired at an RF level of +14dBm (15 watts-28dB antenna isolation) the BER of the receiver is measured to be in equal to that achieved with test case RVSN. (75)

3. RVCO Test Approach: Receiver Test Setup #1. The desired signal generator will be set to produce a VDL Mode 3 signal using a known data pattern at an RF level as indicated in the criteria above. The undesired signal generator will be set to produce an interfering signal as indicated in the criteria above. The receiver's uncorrected digital output will be recorded and compared to the known input bit pattern to produce a bit error rate.

4. RVCO Data Analysis Methods: Under the above test conditions, a bit error rate analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RVCP Objectives: The objective of the RVCP test case is to verify the receiver's capture range frequency offset requirement. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	33*	T	FAA-E-2938	88	T

**Partially verified by this test case. All applicable test cases are: RVCC, RVCO, RVCP, RVCR, RVDR, RVIM, RVOV, and RVSN*

2. RVCP Test Criteria: The receiver will successfully pass the RVCP test case if:

   a. The receiver supports synchronization acquisition and meet the sensitivity requirement of RVSN with a maximum carrier frequency offset of ± 885 Hz from nominal for air/ground communications. (88) Note: This value takes into account the transmitter frequency error (685 Hz) from an airborne transmitter, and the air to ground transmission Doppler shift (200 Hz).

3. RVCP Test Approach: Receiver Test Setup #1. The undesired signal generator will be switched off. The desired signal generator will be set as if to evaluate the sensitivity requirements of test case RVSN. With this signal present at the receiver's RF input, the sensitivity will be measured. Next, the carrier frequency will be offset by +/- 885 Hz. With this signal present at the receiver's RF input, the sensitivity will be measured.

4. RVCP Data Analysis Methods: Under the above test conditions, a bit error rate analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RVCR Objectives: The objective of the RVCR test case is to determine the receiver's ability to reject adjacent channel signals. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	33*	T	FAA-E-2938	79	T

**Partially verified by this test case. All applicable test cases are: RVCC, RVCO, RVCP, RVCR, RVDR, RVIM, RVOV, and RVSN*

2. RVCR Test Criteria: The receiver will successfully pass the RVCR test case if the following conditions are met:

   a. With the desired signal generator set to produce a VDL Mode 3 signal using a known data pattern at an RF level of –97dBm and with an undesired VDL Mode 3 signal offset from the desired by+/-25kHz, at an RF level of –55dBm, the BER of the receiver is measured to be in equal to that achieved with test case RVSN. (79)

3. RVCR Test Approach: Receiver Test Setup #1. The desired signal generator will be set to produce a VDL Mode 3 signal using a known data pattern at an RF level of –97dBm. The undesired signal generator will be set to produce a –55dBm VDL Mode 3 signal. The receiver's uncorrected digital output will be recorded under these conditions, and compared to the known input bit pattern to produce a bit error rate.

4. RVCR Data Analysis Methods: Under the above test conditions, a bit error rate analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RVDR Objectives: The objective of the RVDR test case is to determine the dynamic range characteristics of the receiver in VDL Mode 3. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	33*	T	FAA-E-2938	84	T

**Partially verified by this test case. All applicable test cases are: RVCC, RVCO, RVCP, RVCR, RVDR, RVIM, RVOV, and RVSN*

2. RVDR Test Criteria: The receiver will successfully pass the RVDR test case if:

   a. With the desired signal generator set to produce a VDL Mode 3 signal using a known data pattern at any RF level between –7dBm and -100dBm, the uncorrected BER of the receiver is measured to be in equal to that achieved with test case RVSN. (84)

3. RVDR Test Approach: Receiver Test Setup #1. The undesired signal generator will be switched off. The desired signal generator will be set to produce a VDL Mode 3 signal using a known data pattern at an RF level between -7dBm and -100dBm. Under these conditions, the receiver's BER will be monitored.

4. RVDR Data Analysis Methods: Under the above test conditions, a bit error rate analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RVIM Objectives: The objective of the RVIM test case is to verify the receiver's ability to reject intermodulation signals in VDL Mode 3. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	33*	T	FAA-E-2938	42**	T
FAA-E-2938	41**	T			

**Partially verified by this test case. All applicable test cases are: RVCC, RVCO, RVCP, RVCR, RVDR, RVIM, RVOV, and RVSN*
***Only partially verified by this test case. Also see RAIM.*

2. RVIM Test Criteria: The receiver will successfully pass the RVIM test case if the following conditions are met:

   a. With two interfering signals set to –5dBm, FM modulated with a 400Hz tone at 75kHz deviation, in the band of 87.5MHz – 107.9MHz such that a 3rd order product falls directly under the receiver's desired frequency; the BER of the receiver is not degraded more than 3dB compared to that measured in RVSN. (41)
   b. With two interfering signals set to –30dBm, 90% AM modulated with a 400Hz tone according to the following frequency separation criteria, the BER of the receiver is not degraded more than 3dB compared to that measured in RVSN. (42)

Desired Frequency	Undesired frequency 1	Undesired frequency 2
X	X-2MHz	X-4MHz
X	X+2MHz	X+4MHz

3. RVIM Test Approach: Receiver Test Setup #1. The desired signal generator will be set to produce a VDL Mode 3 signal using a known data pattern at an RF level of -99dBm. The interfering signal generators will be set to produce two signals as called out in the criteria above. With these three signals present at the receiver's RF input, the sensitivity will be measured. This will be repeated for both criteria.

4. RVIM Data Analysis Methods: Under the above test conditions, a bit error rate analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RVOV Objectives: The objective of the RVOV test case is to verify the receiver's ability to reject out of band signals in VDL Mode 3. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	33*	T	FAA-E-2938	81	T

**Partially verified by this test case. All applicable test cases are: RVCC, RVCO, RVCP, RVCR, RVDR, RVIM, RVOV, and RVSN*

2. RVOV Test Criteria: The receiver will successfully pass the RVOV test case if the following conditions are met:

   a. With the desired signal generator set to produce a VDL Mode 3 signal using a known data pattern at an RF level of -98dBm and with an undesired unmodulated carrier in the frequency range 50kHz - 1215MHz (excluding the range 111.975-137.000 MHz) at –4dBm, the BER of the receiver is measured to be in equal to that achieved with test case RVSN. (81)

3. RVOV Test Approach: Receiver Test Setup #1. The desired signal generator will be set to produce a VDL Mode 3 signal using a known data pattern at an RF level of –98dBm. The undesired signal generator will be set to produce a signal as described in the criteria above. The test will be repeated for each of the criteria. The receiver's uncorrected digital output will be recorded under these conditions, and compared to the known input bit pattern to produce a bit error rate.

4. RVOV Data Analysis Methods: Under the above test conditions, a bit error rate analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. RVSN Objectives: The objective of the RVSN test case is to validate the BER performance requirements of the receiver. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	33*	T	FAA-E-2938	575	T
FAA-E-2938	36	T			

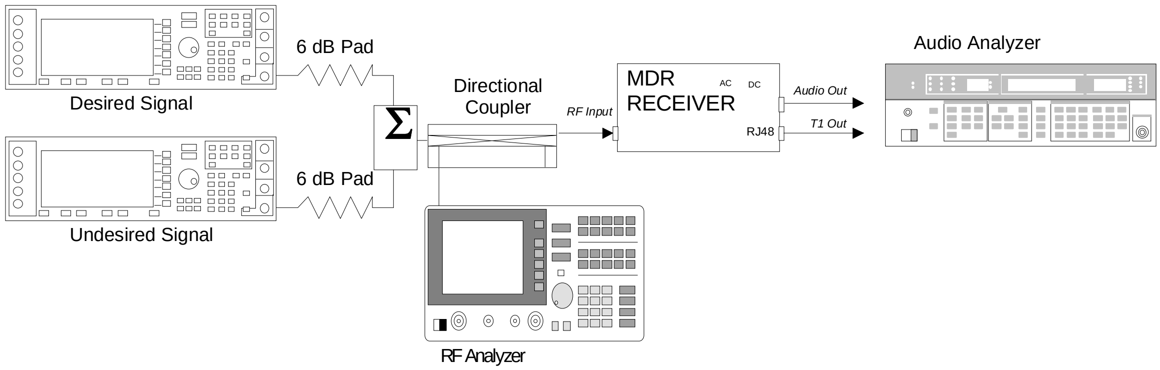
**Partially verified by this test case. All applicable test cases are: RVCC, RVCO, RVCP, RVCR, RVDR, RVIM, RVOV, and RVSN*

2. RVSN Test Criteria: The receiver will successfully pass the RVSN test case if:

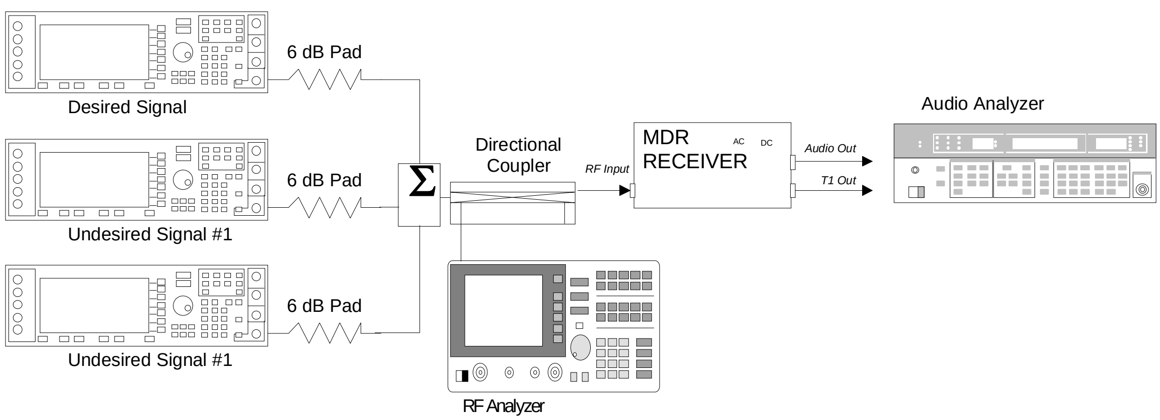
   a. The uncorrected BER performance of equal to or better than 10^{-3} is achieved in the presence of the degradations specified in FAA-E-2938, Sections 3.2.2.1.3, 3.2.2.1.7, 3.2.2.1.17 through 3.2.2.1.22 and 3.2.2.1.25. (33)
   b. In the absence of added external noise, the specified uncorrected BER (see the criteria a) above) is achieved at a signal level of -100dBm at the receiver RF input from a modulated VDL Mode 3 signal source. (36)
   c. The receiver searches for the appropriate burst synchronization as indicated by the information contained within the Sync Search Control message as per NAS-IC-41033502. (575)

3. RVSN Test Approach: Receiver Test Setup #1. The undesired signal generator will be switched off. The desired signal generator will be set to produce a VDL Mode 3 signal using a known data pattern at an RF level of -100dBm. The receiver's digital output will be recorded under these conditions, and compared to the known input bit pattern to produce a bit error rate. By virtue of conducting this test, it will also be determined if the receiver meets the criteria of item c. above (575).

4. RVSN Data Analysis Methods: Under the above test conditions, a bit error rate analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.



Receiver Test Setup #1



Receiver Test Setup #2

APPENDIX B3 - TRANSMITTER TEST CASES

<u>DSB-AM Transmitter Test Description</u>: The DSB-AM Transmitter Test Cases will focus on validating the transmitter characteristics for the DSB-AM mode. Emphasis will be placed on verifying the listed requirements utilizing 25kHz channel spacing. All transmitter test cases will apply to both the 15 watt and 50 watt transmitters unless otherwise noted. The following pages describe the DSB-AM mode transmitter test cases identified in Figure 6.

1. TAAP Objectives: The objective of the TAAP test case is to determine the transmitters' spectral mask characteristics/adjacent channel power outputs. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	138*	T	FAA-E-2938	391*	T
FAA-E-2938	140*	T	FAA-E-2938	392*	T
FAA-E-2938	141*	T	FAA-E-2938	656	T

** Partially verified by this test case. Also see TVAP.*

2. TAAP Test Criteria: The transmitters will meet the TAAP test case if:

a. Spurious emission levels meet the limits imposed by the transmit mask in criteria b. through d. below. (138)
b. While in a fixed tuned configuration or remotely tuned configuration, the amount of power from a transmitter when measured over the 25kHz channel bandwidth of the first adjacent channel does not exceed -40dBc (-62dBc in center 16kHz). (140, 391)
c. When in a fixed tune configuration, the amount of power from an MDR transmitter when measured over the 25kHz channel bandwidth of the second and third adjacent channels is be -65dBc maximum, -70dBc maximum for the fourth through seventh adjacent channels, -75dBc maximum for the eighth through fifteenth adjacent channels, -92dBc maximum for the sixteenth through nineteenth adjacent channels, and -113dBc maximum for any frequency greater than 500kHz from the tuned channel center and –137dBc maximum for any frequency greater than 2MHz from the tuned channel center. (141)
d. While in remotely tunable configuration, the amount of power from an MDR transmitter when measured over the 25kHz channel bandwidth of the second and third adjacent channels is -65dBc maximum, -70dBc maximum for the fourth through seventh adjacent channels, -75dBc maximum for the eighth through fifteenth adjacent channels, -92dBc maximum for the sixteenth through nineteenth adjacent channels, and -107dBc maximum for any frequency greater than 500kHz from the tuned channel center. (392)
e. Use of an external signal generator is not required to tune the MDR to meet the spectral mask requirements. (656).

3. TAAP Test Approach: The transmitter will be tuned and configured for DSB-AM mode. Using Transmitter Test Setup #5, the transmitter will be modulated 100% with a 1004 Hz tone. Using the controlling computer the transmitted spectrum will be captured in a band +/- 2 MHz from the operating frequency.

This test will be conducted on three frequencies at low, middle and high points of the band for which it was designed and will maintain continuous key operation for at least one minute per iteration.

The test will be conducted in both the fixed tuned and remotely tunable configurations, as applicable to the MDR design.

By virtue of conducting the above tests, it will be determined if an external signal generator is required to re-tune the MDR transmitters to meet the spectral mask requirements.

4. TAAP Data Analysis Methods: Under the above test conditions, a spectrum analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. TACN Objectives: The objective of the TACN test case is to determine the transmitters' carrier induced audio noise level. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	142	T			

2. TACN Test Criteria: The transmitter will successfully pass the TACN test case if the following can be accomplished:

   a. The carrier-induced audio noise level due to the MDR transmitting a CW signal is at least 40.0dB below the detected audio output (300 Hz – 3.0 kHz detected bandwidth) when the carrier is modulated 90% with a 1004 Hz tone. (142)

3. TACN Test Approach: The transmitter will be tuned and configured for DSB-AM. Using Transmitter Test Setup #2, the transmitter will be 90% modulated with a 1004 Hz tone at 15 watts (and/or 50 watts). An RF detector will demodulate the transmitted signal and the audio analyzer will measure the audio level. The modulation will then be removed and the audio level measured again.

4. TACN Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirement and logged within the controlling computer

1. TAHT Objectives: The objective of the TAHT test case is to determine the transmitters' harmonic distortion characteristics. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	111	T	FAA-E-2938	112	T

2. TAHT Test Criteria: The transmitter will successfully pass the TAHT test case if the following can be accomplished:

a. With an audio tone input set to between 300Hz and 3.0kHz, at any level between -25.0dBm to +20.0dBm, and the modulator adjusted to achieve 90% modulation, the resulting modulation distortion does not exceed 5% rms. (112)

b. Over the same frequency range when the audio input level is set to achieve maximum limiting (see FAA-E-2938, Section 3.2.2.2.4.2), the modulation distortion does not exceed 10% rms. (111)

3. TAHT Test Approach: The transmitter will be tuned and configured for DSB-AM mode. Using Transmitter Test Setup #2, the transmitter will be set to produce the maximum RF output for which it was designed, 90% modulated with frequencies of 300Hz to 3kHz in 100Hz increments. Harmonic distortion will be measured at each audio level and logged using a GPIB controller.

This test will be repeated with maximum limiting. Harmonic distortion will be measured at each step.

4. TAHT Data Analysis Methods: Under the above test conditions, an audio analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. TAKT Objectives: The objective of the TAKY test case is to verify the transmitter's keying time. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	149	T			

2. TAKT Test Criteria: The transmitter(s) will successfully pass the TAKT test case if:

   a. The keying time does not exceed 15ms as measured from the application of a key signal to the time when the transmitter is at 90% of the full power level. (149)

3. TAKT Test Approach: The transmitter will be tuned and configured for DSB-AM mode. Using Transmitter Test Setup #6, a PTT will be initiated via the GPIB controller and simultaneously captured on channel 'A' of a digital oscilloscope. The RF output will be converted to a representative DC value via an RF detector that will be captured on channel 'B' of the same oscilloscope. The keying time is the difference between signal rises on channels 'A' and 'B'(149).

4. TAKT Data Analysis Methods: The keying time will be calculated from the oscilloscope. The results will be checked against the requirement and logged within the controlling computer.

1. TAKY Objectives: The objective of the TAKY test case is to verify the transmitters' remote keying capabilities. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	145	T	FAA-E-2938	151	T
FAA-E-2938	146	T	FAA-E-2938	219*	T
FAA-E-2938	148	T	FAA-E-2938	373	T
FAA-E-2938	150	T	FAA-E-2938	697**	T

**Partially verified by this test case. Also see TAML.*
***Partially verified by this test case. Also see AATR.*

2. TAKY Test Criteria:
The transmitter will successfully pass the TAKY test case if:

a. In the "Current Keyed" mode the following signal levels apply: 0VDC ± 1V (Ground) – Keyed; Open - No Key (10mA max for duration of key). (145 and 219)
b. In the "Voltage Keyed" mode, the following signal levels apply: +6VDC to +48VDC – Keyed; Open - No Key. (145, 219, and 373)
c. For voltage keying, the sink current is 0.5mA max. (151 and 219)
d. There exists a PTT confirm signal of dry contact closure isolated from ground (1A max., <80VDC). (219)
e. The remote keying signal for current or voltage control is on separate pins of the remote connector. (146)
f. For ground keying, the source current does not exceed 10ma and generate a pull-up voltage exceeding +40V. (219 and 148)
g. The transmitter continues to transmit while the keying signal is present per items a. and b. above. (150)
h. The MDR transmitter provides a Transmit Indicator signal via the Transmitter remote connector (RCE) for the duration of the transmissions. (697)

3. TAKY Test Approach:
The following will be tested with the MDR connected to the OCT Test Bed transmitter radio interface '66' block.

a. Ground Keying
    - The ground keying pull-up/source voltage (<40VDC) of the MDR transmitter will be measured with a voltmeter at the PTT ground keying signals of the OCT Test Bed. (148 and 219)
    - The ground signal from the MDR will be used to apply the ground key, and keying current (<10mA) will be measured with an amp meter in-series with the PTT ground keying signals of the OCT Test Bed. (148 and 219)
    - The ground key voltage (0VDC) will be varied ± 1V and will be applied to the ground (current) keying input signals of the OCT Test Bed to verify the ability of the MDR to key. (145, 146, and 219)
b. Voltage Keying

- The source voltage will be varied between +6 and +48VDC and applied to the (voltage) keying input signals of the OCT Test Bed to verify the ability of the MDR to key. (145, 146, and 219)
- During voltage keying of the MDR (varied between +6 and +48VDC) the sink current (<0.5mA) of the MDR will measured with an amp meter in-series with the PTT voltage keying signals of the OCT Test Bed. (151, and 219)

c. Keyed/non-Keyed
   - The MDR transmitter continues to key when either ground (current) or voltage keying is applied. (150)
   - The MDR transmitter does **not** key when either ground (current) or voltage keying is **not** applied or the input is open. (373)

d. PTT Confirmation
   - With no PTT/Key present, each contact of the PTT confirmation signal will be measured with an ohmmeter to signal ground (open) and each other (open). (219)
   - With a PTT/Key present, each contact of the PTT confirmation signal (a.k.a. Transmit Indicator signal (697)) will be measured with an ohmmeter to signal ground (open) and each other (closed). (219)

4. <u>TAKY Data Analysis Methods</u>: The results will be checked against the requirement and manually logged.

1. TALK Objectives: The objective of the TALK test case is to verify the transmitters' DSB-AM remote and local keying/audio operation. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	96*	T	FAA-E-2938	144	T
FAA-E-2938	97*	T	FAA-E-2938	147	T
FAA-E-2938	98*	T	FAA-E-2938	371	T
FAA-E-2938	143	T			

**The requirement will not be verified with PCM voice during OCT.*

2. TALK Test Criteria: The transmitter will successfully pass the TALK test case if:

   a. The transmitter accepts both local and remote keying signals. (143).
   b. The voice input is PTT controlled. (97)
   c. The transmitter receives a PTT signal from the RCE for analog voice originating from the control site. (371)
   d. Local keying signal is accomplished via a push-to-talk microphone connected directly to the transmitter. (144)
   e. Remote keying takes priority over local keying when the transmitter is on-line. (147)
   f. There are three audio inputs to the transmitter: 1) analog voice from the control site, 2) analog local voice from the jack on the front of the transmitter, (96)
   g. One of the audio inputs is active at one time. (98)

3. TALK Test Approach: The transmitter will be tuned and configured for DSB-AM mode. Using Transmitter Test Setup #2, for each audio input a PTT will be initiated and a –8dBm 1004Hz tone injected. The transmitted tone will be verified through an RF detector and an audio analyzer. (96, 97, 143, 144, and 371)

With the transmitter locally keyed, remote PTT and audio will be applied when the MDR is in the Online mode. It will be verified that the remote PTT has priority. (147)

Separate audio tones of 400Hz and 1004Hz will be simultaneously injected into the audio ports and the demodulated signal will be analyzed for audio degradation that would imply multiple tones. (96 and 98)

4. TALK Data Analysis Methods: The results will be checked against the requirements and manually logged.

1. TAML Objectives: The objective of the TAML test case is to determine the transmitters' ability to prevent overmodulation and to maintain a steady modulation level. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	103	T	FAA-E-2938	219**	T
FAA-E-2938	113*	T			

**The requirement will not be verified with PCM voice during OCT.*
***Partially verified by this test case. Also see TAKY.*

2. TAML Test Criteria: The transmitter will successfully pass the TAML test case if the MDR transmitter s prevents overmodulation of the carrier under all conditions and to retain a modulation level:
   1) at ± 10% of the setting of the Control Parameter ID#13, transmitter Modulation Percent (AM) and
   2) that does not exceed 100% for a 1004 Hz tone with an audio level that varies over the full specified input range when either the 600 ohm main audio input (regardless of audio input level setting) or the PCM voice is used. (103, 113, and 219)

3. TAML Test Approach: The transmitter will be tuned and configured for DSB-AM mode. Using Transmitter Test Setup #2, the transmitter will be 90% modulated with a 1004Hz tone. The input audio level will be increased from –25dBm to +10dBm (600 Ohm) in 1dBm increments. The percent modulation will be measured with an audio analyzer. This measurement will be conducted with input audio provided through the transmitter’s remote audio input. (113 and 219)

FAA-E-2938 Shall #103 will be demonstrated by virtue of conducting the above test.

4. TAML Data Analysis Methods: Under the above test conditions, a measurement receiver (HP8902) will be automatically queried. The results will be checked against the requirement and logged within the controlling computer.

1. TARF Objectives: The objective of the TARF test case is to verify the transmitters' RF output power requirements, for any power level, in the DSB-AM mode. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	114*	T	FAA-E-2938	128	T
FAA-E-2938	115	T	FAA-E-2938	130	T
FAA-E-2938	116*	T	FAA-E-2938	678	T
FAA-E-2938	124	T	FAA-E-2938	690	T
FAA-E-2938	126	T	FAA-E-2938	692	T

**Partially verified by this test case. Also see TVRF.*

2. TARF Test Criteria: The transmitter will successfully pass the TARF test case if the following can be accomplished:

a. The transmitter frequency is stable when operating in any mode at any power level for load VSWR up to and including 3.0:1. (114)
b. The MDR transmitter operates at a VSWR of 2.0:1 or less with no damage, with no part exceeding dissipation limits and with no performance degradation. (116)
c. The transmitter delivers not less than 50% of the set CW RF signal power (15 watt and 50 watt) into any impedance having a maximum VSWR of 3:1 at any phase angle. (126 and 130)
d. The 15 watt Transmitter delivers the RF output specified in Control Parameter #12, Power Output, into a nominal 50 ohm load impedance when transmitting a CW signal. (124)
e. The 50 watt Transmitter delivers the RF output specified in Control Parameter #12, Power Output, into a nominal 50 ohm load impedance when transmitting a CW signal. (128)
f. The transmitter does not suffer any damage or performance degradation (and meets all of its requirements), after transmitting (in DSB-AM and a predefined power level) into an open or a short circuit. (115)
g. For a single transmitter enclosure,
   (1) The MDR transmitter delivers the RF output as specified in the Control Parameter #12, Power Output, into a nominal 50 ohm load impedance when transmitting a CW signal. (690)
   (2) The MDR transmitter delivers not less than 50% of the set CW RF signal power into any impedance having a maximum VSWR of 3:1 at any phase angle. (692)
h. The MDR transmitter shall meet the output power levels specified in either the remotely tuned configuration or the fixed tuned configuration. (678)

3. TARF Test Approach: The transmitter will be tuned and configured for DSB-AM mode. Using Transmitter Test Setup #3, the VSWR box will be set to produce a VSWR of 1:1 and a 0° phase angle (50 ohm nominal impedance). With no modulation (CW) the transmitter output power will be adjusted from factory default to the maximum for which it was designed. The resulting RF power and frequency will be measured on a spectrum analyzer with frequency

counter option. This measurement will be repeated with the carrier 90% modulated with a 1004Hz tone and the percent difference calculated in post analysis.

This measurement will be conducted for VSWRs from 1:1 at any phase angle up to and including 3:1 at any phase angle.

The VSWR Box will be set to produce a short and the transmitter will be keyed. The VSWR will then be returned to 1:1 and a few selected performance measurements will be performed to verify the transmitter is operating normally.

The VSWR box will be set to produce an open and the transmitter will be keyed. The VSWR will then be returned to 1:1 and a few selected performance measurements will be performed to verify the transmitter is operating normally.

Any or all of the above test approaches may be performed in the fixed tuned and/or remotely tuned configurations. (678)

4. TARF Data Analysis Methods: Under the above test conditions, a spectrum analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

<u>VDL Mode 3 Transmitter Test Description</u>: The VDL Mode 3 Transmitter Test Cases will focus on validating the transmitter characteristics for the VDL Mode 3. Emphasis will be placed on verifying the listed requirements utilizing various slot combinations. All transmitter test cases will apply to both the 15 watt and 50 watt transmitters unless otherwise noted. The following pages describe the VDL Mode 3 transmitter test cases identified in Figure 6.

1. TVAP Objectives: The objective of the TVAP test case is to determine the transmitters' spectral mask characteristics/adjacent channel power outputs in VDL Mode 3 mode. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	138*	T	FAA-E-2938	391*	T
FAA-E-2938	140*	T	FAA-E-2938	392*	T
FAA-E-2938	141*	T			

** Partially verified by this test case. Also see TAAP.*

2. TVAP Test Criteria: The transmitter will successfully pass the TVAP test case if the following can be accomplished.

a. Spurious levels meet the limits imposed by the transmit mask of criteria b. through d. below. (138)
b. While in a fixed tuned and remotely tunable configurations, the amount of power from a transmitter under all operating conditions when measured over the 25kHz channel bandwidth of the first adjacent channel does not exceed -40dBc (-62dBc in center 16kHz). (140)
c. In the fixed tuned configuration, the amount of power from an MDR transmitter under all operating conditions when measured over the 25kHz channel bandwidth of the second and third adjacent channels is -65dBc maximum, -70dBc maximum for the fourth through seventh adjacent channels, -75dBc maximum for the eighth through fifteenth adjacent channels, -92dBc maximum for the sixteenth through nineteenth adjacent channels, and -113dBc maximum for any frequency greater than 500kHz from the tuned channel center and –137dBc maximum for any frequency greater than 2MHz from the tuned channel center. (141)
d. In the remotely tunable configuration, the amount of power from an MDR transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the second and third adjacent channels is -65dBc maximum, -70dBc maximum for the fourth through seventh adjacent channels, -75dBc maximum for the eighth through fifteenth adjacent channels, -92dBc maximum for the sixteenth through nineteenth adjacent channels, and -107dBc maximum for any frequency greater than 500kHz from the tuned channel center. (392)

3. TVAP Test Approach: The transmitter will be tuned and configured for VDL Mode 3. Using Transmitter Test Setup #5, control software either internal to the HP89441 or a separate GPIB controller will capture the transmitted spectrum in a band +/- 2MHz from the operating frequency.

This test will be conducted on several slot configurations. The test will be conducted on three frequencies at low, middle and high points of the band for which it was designed and will maintain continuous key operation for at least one minute per iteration.

The test will be conducted in both the fixed tuned and remotely tunable configurations, as applicable.

4. TVAP Data Analysis Methods: Under the above test conditions, a vector analyzer will be automatically queried. The results will be checked against the requirement and logged within the controlling computer

1. TVMD Objectives: The objective of the TVMD test case is to determine if the transmitters meet the VDL Mode 3 modulation and distortion requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	10	T	FAA-E-2938	109	T
FAA-E-2938	11	T			

2. TVMD Test Criteria: The transmitter will successfully pass the TVMD test case if the following can be accomplished.

   a. The error vector magnitude (EVM) of the D8PSK transmitted I/Q constellation is not greater than 5%. (109)
   b. The VDL Mode 3 transmitter uses the Differential 8 Phase Shift Keying (D8PSK) modulation scheme defined in the RTCA VDL Mode 3 MASPS (10)
   c. The VDL Mode 3 symbol rate is 10,500 symbols/s with a tolerance of ±2 ppm, resulting in a nominal data rate of 31,500 bps. (11)

3. TVMD Test Approach: The transmitter will be tuned and configured for VDL Mode 3 mode. Using Transmitter Test Setup #3, the VSWR Box will be set to produce a VSWR of 1:1 at a 0 degree phase angle (50 ohm nominal impedance). The I/Q constellation is captured using an HP 89441a vector analyzer. The vector analyzer calculates the EVM.

This test will be conducted over several TDMA slot configurations to be determined at a later date.

This test will be conducted on three frequencies at low, middle and high points of the band for which it was designed and will maintain continuous key operation for at least one minute per iteration.

During the conduct of the above testing, the VDL Mode 3 modulation scheme will be verified and the symbol rate will be measured.

4. TVMD Data Analysis Methods: Under the above test conditions, a vector analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. TVRF Objectives: The objective of the TVRF test case is to test the RF transmitter output power requirements, for any power level, in the VDL Mode 3. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	9***	T	FAA-E-2938	121**	T
FAA-E-2938	114*	T	FAA-E-2938	122	T
FAA-E-2938	116*	T	FAA-E-2938	131	T
FAA-E-2938	117	T	FAA-E-2938	687	T
FAA-E-2938	118**	T	FAA-E-2938	688**	T
FAA-E-2938	119	T	FAA-E-2938	689	T
FAA-E-2938	120**	T			

**Partially verified by this test case. Also see TARF.*
***The 0.5dB step size will not be verified. Only the upper range limit will be verified.*
****Only the transmitter ramp-up and ramp-down timing will be verified. Also see AMAC.*

2. TVRF Test Criteria: The transmitter will successfully pass the TVRF test case if the following can be accomplished.

a. The transmitter is stable when operating in any mode at any power level for a load Voltage Standing Wave Ratio (VSWR) up to and including 3.0:1. (114)
b. The transmitter operates at a VSWR of 2.0:1 or less with no damage, with no part exceeding dissipation limits and with no RF power level output performance degradation. (116) *Note: Only RF power level output performance will be verified.*
c. The transmitter delivers not less than 50 % of the set RF signal power into any impedance having a maximum VSWR of 3:1 at any phase angle for 15 watts and 50 watts. (119, 122, and 689)
d. The transmitter has the ability to change the power in each TDMA slot for VDL Mode 3 operation. (131)
e. The transmitter ramp-up and ramp-down timing conforms to RTCA DO-224a. (9)
f. For the 15 watt Transmitter, the transmitter delivers a minimum RF output (averaged over a V/D-burst or M-burst) as specified in the header of the burst into a nominal 50 ohm load and has an output power range of 2 to 15 watts (117 and 118).
g. For the 50 watt Transmitter, the transmitter delivers the RF power output (averaged over a V/D burst or M-burst) as specified in the header of the burst into a minimum RF output power of 50 watts into a nominal 50 ohm load and has an output power range of 10 to 50 watts (120 and 121).
h. For a single transmitter enclosure,
   (1) The MDR transmitter delivers the RF output (averaged over a V/D-burst or M-burst) as specified in the header of the burst into a nominal 50 ohm load impedance. (687)
   (2) The MDR transmitter RF output is from 2 watts to 50 watts. (688)

3. TVRF Test Approach: The transmitter will be tuned and configured for VDL Mode 3 mode. Transmitter Test Setup #3 will be used. The VSWR Box will be set to produce VSWRs from 1:1 at 0° phase angle up to and including 3:1 at 359° phase angle. The transmitter will be set with all

slots active and will be adjusted from the factory default to the maximum power for which it was designed. Under these various load conditions, the transmitter's RF output power will be measured.

During the measurement of the transmitter burst power, the ramp-up and ramp-down characteristics of the burst will be measured and recorded.

By virtue of performing the above tests, it can be determined if the transmitter has the ability to change power for each slot (131), and has the required upper range power output limit (117, 118, 120, and 121).

4. <u>TVRF Data Analysis Methods</u>: Under the above test conditions, a spectrum analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer

Dual DSB-AM and VDL Mode 3 Mode Transmitter Test Description: The following Transmitter Test Cases will focus on validating the transmitter characteristics that are independent of transmitter mode (DSB-AM or VDL Mode 3) or that are more easily combined into one test. All transmitter test cases will apply to both the 15 watt and 50 watt transmitters unless otherwise noted.

1. TXDC Objectives: The objective of the TXDC test case is to test the transmitters' duty cycle capabilities at the rated carrier output for DSB-AM and for VDL Mode 3. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	136*	T	FAA-E-2938	137*	T

*Continuous operation for 8,760 hours will not be verified during OCT. Testing will be limited to a minimum of 24 hours.

2. TXDC Test Criteria: The transmitter will successfully pass the TXDC test case if the following can be accomplished.

a. The transmitter can operate at a 100% continuous unattended duty cycle at the maximum rated output. (137)
b. The transmitter operates at a 79.5% (4 active slot TDMA) unattended duty cycle at the maximum rated output continuously. (136)

3. TXDC Test Approach: The transmitter will be tuned and configured for DSB-AM mode. Using Transmitter Test Setup #1, the transmitter modulated 100% with a 1004 Hz tone will be keyed for a minimum of 20 hours with the RF power being measured at the end of this period. (137)

The transmitter will then be configured for VDL Mode 3 mode with all 4 slots active. The transmitter will then be run for a minimum of 4 additional hours. The maximum rated output and the duty cycle will be verified during the test. (136)

4. TXDC Data Analysis Methods: Under the above test conditions, a spectrum analyzer will be automatically queried. The results will be checked against the requirements and logged within the controlling computer.

1. TXHO Objectives: The objective of the TXHO test case is to determine the transmitters' harmonic output characteristics. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	139*	T			

** This requirement will only be verified in DSB-AM mode.*

2. TXHO Test Criteria: The transmitter will successfully pass the TXHO test case if:

   a. The level of each harmonic frequency of the carrier is less than -80.0dBc (-65dBm within the Global Positioning System (GNSS) band) when measured at the MDR RF output. (139) *Note: this measurement will be at the full power level of 50 watts (for 50 watt maximum transmitters) as well as 15 watts (for 15 watt maximum transmitters) for DSB-AM Mode.*

3. TXHO Test Approach: The transmitter will be tuned and configured for DSB-AM mode. Using Transmitter Test Setup #3, the VSWR Box will be set to produce a VSWR of 1:1 at a 0° phase angle (50 ohm nominal impedance). The spectrum analyzer will be tuned to no less then 10 harmonics of the operating frequency and at each frequency the harmonic level measured.

This test will be conducted on three frequencies at low, middle and high points of the band for which it was designed and will maintain continuous key operation for at least one minute per iteration. The output power will be at 15 watts and/or 50 watts.

4. TXHO Data Analysis Methods: Under the above test conditions, a spectrum analyzer will be automatically queried. The results will be checked against the requirement and logged within the controlling computer.

1. TXIM Objectives: The objective of the TXIM test case is to determine the transmitters' intermodulation characteristics in VDL Mode 3 and DSM-AM mode. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	135*	T			

** This requirement is not mode dependent and will only be verified in DSB-AM mode.*

2. TXIM Test Criteria: The transmitter will successfully pass the TXIM test case if: in the fixed tuned configuration, the amplitude of each radio frequency back intermodulation product is at least 40 dB below the amplitude of an interfering signal fed into the MDR RF output at either:

1) 28 dB below the transmitter maximum output level and spaced ± 2MHz from the MDR transmitter output frequency or
2) 42 dB below the transmitter maximum output level and spaced ± 500kHz from the MDR transmitter output frequency. (135)

3. TXIM Test Approach: The transmitter will be tuned and configured for DSB-AM mode. Using Transmitter Test Setup #4 a signal generator is used to produce the interfering signal tuned to produce an intermod +/- 500 kHz from the desired transmitter. The resulting intermod will be captured via a spectrum analyzer. The signal generator will next be tuned to produce an intermod +/- 2MHz from the desired transmitter. The resulting intermod will be captured via a spectrum analyzer.

4. TXIM Data Analysis Methods: Under the above test conditions, a spectrum analyzer will be automatically queried. The results will be checked against the requirement and logged within the controlling computer.

1. TXTL Objectives: The objective of the TXTL test case is to verify that the transmitters meet the in-band leakage requirements for VDL Mode 3 and DSB-AM mode. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	134*	T			

** This requirement is not mode dependent and will only be verified in DSB-AM mode.*

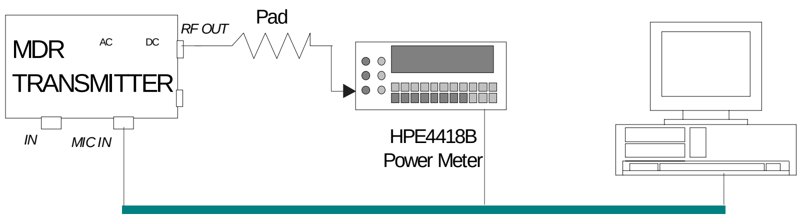
2. TXTL Test Criteria: The transmitter will successfully pass the TXTL test case if the following can be accomplished.

   a. When unkeyed, the MDR transmitter does not produce more than -97dBm in-band leakage measured at the MDR RF output.

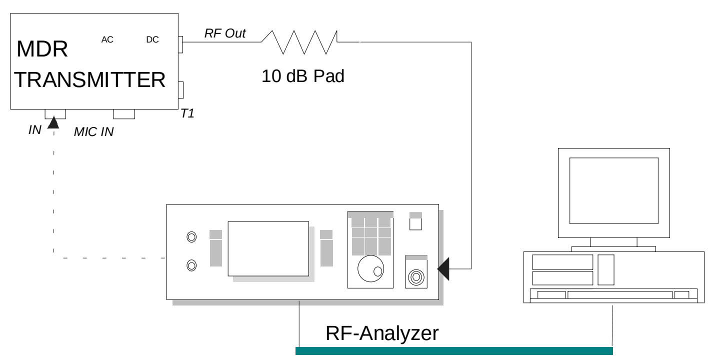
3. TXTL Test Approach: The transmitter will be tuned and configured for DSB-AM mode. Using Transmitter Test Setup #5, the transmitter remains un-keyed and the on-channel power leakage will be measured with the vector analyzer.

This test will be conducted on three frequencies at low, middle and high points of the band for which it was designed and will maintain continuous key operation for at least one minute per iteration.

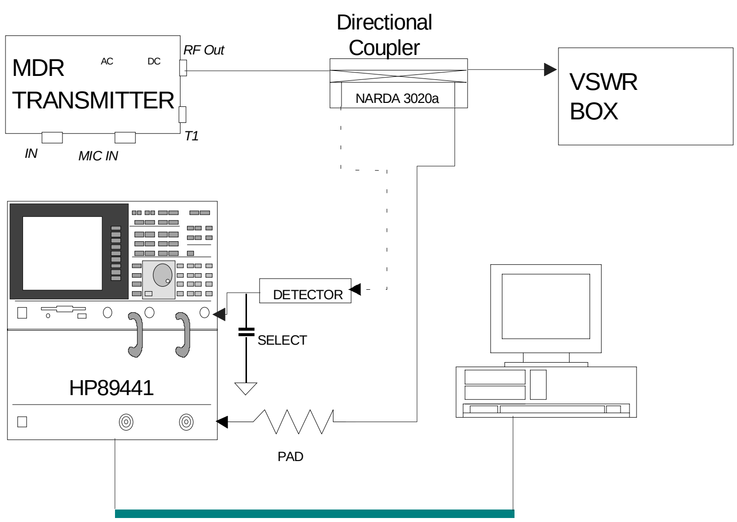
4. TXTL Data Analysis Methods: Under the above test conditions, a vector analyzer will be automatically queried. The results will be checked against the requirement and logged within the controlling computer.



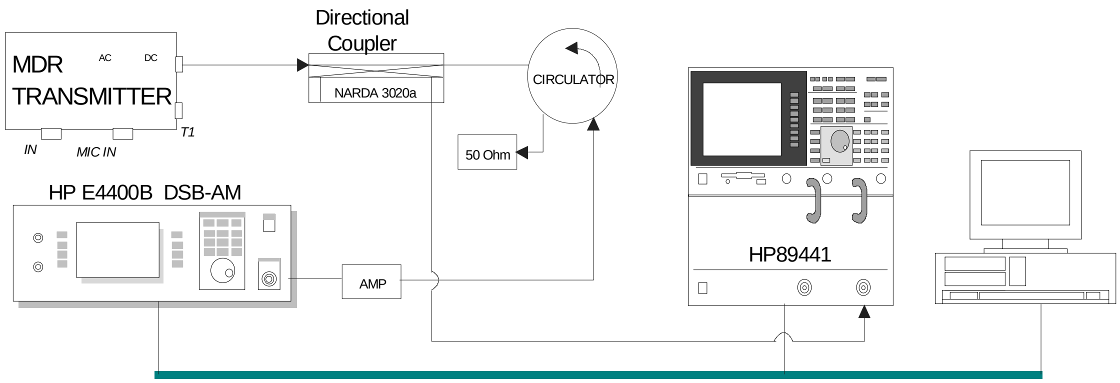
Transmitter test setup #1



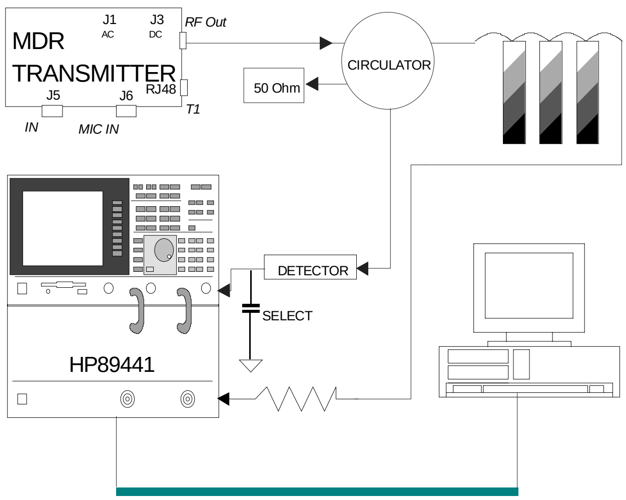
Transmitter test setup #2



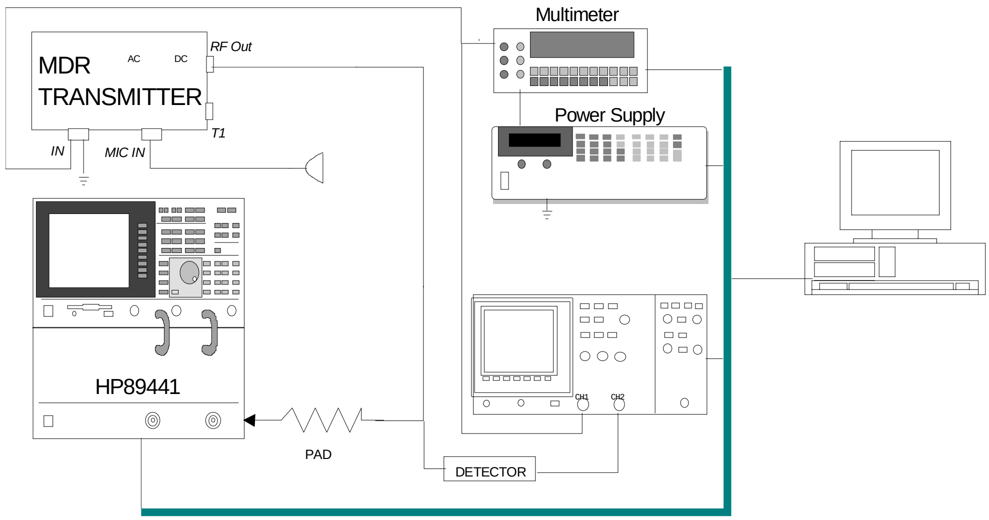
Transmitter test setup #3



Transmitter test setup #4



Transmitter test setup #5



Transmitter test setup #6

APPENDIX B4 - PHYSICAL TEST CASES

Physical Test Descriptions: The Physical Test Cases will focus on inspection of various physical and mechanical features of the MDRs. All test cases apply to both the transmitter and receiver unless otherwise noted. The following pages describe the Physical test cases contained in Figure 7.

1. PCON Objectives: The objective of the PCON test case is to inspect the various connectors on the transmitter(s) and receiver. This includes the power connectors, interface connectors, power cords, and front panel connectors. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	29	I	FAA-E-2938	323 and 324	I
FAA-E-2938	31	I	FAA-E-2938	340	I
FAA-E-2938	102	I	FAA-E-2938	384	I
FAA-E-2938	104 and 105	I	FAA-E-2938	386	I
FAA-E-2938	213 through 216	I	FAA-E-2938	615 through 619	I
FAA-E-2938	218	I	FAA-E-2938	650	I
FAA-E-2938	220 through 227	I	FAA-E-2938	653 through 655	I
FAA-E-2938	321	I			

2. PCON Test Criteria: All connectors must conform to the type specified (i.e. form, fit, and function) to pass the associated requirement. In addition, any connector not located on the MDR units as described (e.g. front panel, rear panel), will not pass the associated requirement. Female BNC type test points are to be incorporated, as necessary.

3. PCON Test Approach: This test case will examine the physical connectivity of the MDR units such that all connectors meet the type specified. The RF, Input Power, RCE, Headset, Microphone, MDT, ATR, REF FREQ, and RIU connectors will all be inspected. An associated mating connector will be inserted for each type specified to ensure proper connectorization.

4. PCON Data Analysis Methods: Not Applicable.

1. PDSP Objectives: The objective of the PDSP test case is to verify by inspection the transmitter's and receiver's indicators and displays. This includes the power indicators and the front panel display. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	299	I	FAA-E-2938	657 and 658	I
FAA-E-2938	302	I	FAA-E-2938	671	I
FAA-E-2938	305 through 307	I	FAA-E-2938	686	I

2. PDSP Test Criteria: For successful completion of this test case, each control or indicator must function as described in the associated requirement (e.g. the detent position, push button operation, or power-on indications). In addition, each control or indicator must be located (e.g. front panel, rear panel) on the MDRs as specified and the front panel display must have the required viewing capabilities.

3. PDSP Test Approach: This test will ensure that all MDR's external controls operate and provide the proper illumination as required. The Power On/Off Switches and Indicators as well as the Front Panel Display Controls will be manipulated repeatedly and inspected for compliance.

4. PDSP Data Analysis Methods: Not applicable.

1. PELC Objectives: The objective of the PELC test case is to verify the protective electrical requirements of the MDR. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	328 and 329	I			

2. PELC Test Criteria: To successfully complete this test case, overload protection circuits must be incorporated in the design of the MDR. In addition, the Offeror must have protective caps over infrequently used connectors.

3. PELC Test Approach: Any infrequently used connectors will be examined to ensure that protective caps are provided as specified. The current overload circuits will be examined and operated as specified.

4. PELC Data Analysis Methods: Not applicable.

1. PF&L Objectives: The objective of the PF&L test case is to verify by inspection that the MDRs meet the function and labeling requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	260 and 261	I	FAA-E-2938	309 through 314	I

2. PF&L Test Criteria: In order to successfully pass this test case, each transmitter and receiver and all associated functions shall be properly identified and labeled as specified in the associated requirements.

3. PF&L Test Approach: The MDR will be inspected to verify that all functions, such as connectors and fuses, are permanently labeled and identified. The functions and corresponding labels are specified in Table 3-5 of the FAA-E-2938. Each connector will be inspected to verify that the pin layouts are correctly identified. The nameplates will be examined to ensure that they are mounted and labeled as specified in FAA-G-2100, Section 3.3.3.1 and associated Subsections.

4. PF&L Data Analysis Methods: Not applicable.

1. PMEC Objectives: The objective of the PMEC test case is to verify by inspection the various mechanical construction requirements for the MDRs. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	252 and 253	I	FAA-E-2938	264	I
FAA-E-2938	258 and 259	I			

2. PMEC Test Criteria: In order to pass this test case, the MDR must comply with all requirements as specified. Specifically, the MDR must comply with the rack mounting requirements as described.

3. PMEC Test Approach: The MDR will be inspected to ensure that the equipment conforms to all mechanical construction requirements as specified. Each MDR component (i.e. the two unique transmitters and the receiver) will be installed into a FAA standard rack configuration. The MDR components will be inspected for ease of installation, removal, mechanical alignment, and maintenance access via the slides.

4. PMEC Data Analysis Methods: Not applicable.

1. PREM Objectives: The objective of the PREM test case is to inspect all mating connectors and jumpers for the MDRs. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	295	I	FAA-E-2938	385	I

2. PREM Test Criteria: If the MDR components require interconnection, then mating connectors must be supplied with the MDR to meet the specified FAA-E-2938 requirement (295). Three jumpers for ATR connections are to be supplied and meet the FAA-E-2938 requirement (385).

3. PREM Test Approach: All equipment requiring interconnection, including ATR cable assemblies and the MDT, will be checked to verify that mating connectors are supplied. Presence and connection of the ATR jumpers will also be checked.

4. PREM Data Analysis Methods: Not Applicable.

1. PS&W Objectives: The objective of the PS&W test case is to verify that the MDRs meet various physical requirements. This includes the equipment size and weight requirements for the MDRs. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	1	I	FAA-E-2938	256	T
FAA-E-2938	254	T	FAA-E-2938	257	T
FAA-E-2938	255	T			

2. PS&W Test Criteria: To successfully pass this test case, the following requirements must be met:

a. Each receiver does not exceed 2 units in height and 18.5 inches in depth.
b. Each 15 watt transmitter or single enclosure MDR transmitter does not exceed 3 units in height and 18.5 inches in depth.
c. Each 50 watt transmitter does not exceed 4 units in height and 18.5 inches in depth.
d. The individual receiver and transmitter does not exceed 37 pounds for each unit.
e. There is a separate MDR transmitter and MDR receiver.

3. PS&W Test Approach: The height of the MDR components will be measured with a standard tape measure. The weight of the individual MDR components will be recorded on a certified scale.

4. PS&W Data Analysis Methods: The weight results of each MDR unit under test will be recorded from the officially certified scale. In addition, the measurements of each MDR unit from the tape measure will be recorded. All results will be compared to the requirements as stated.

APPENDIX B5 - ANALYSIS TEST CASES

Analysis Test Descriptions: The Analysis Test Cases will focus on validating requirements of the MDRs by review and study of documentation of provided by each Offeror. All test cases will apply to both the transmitters and receiver in DSB-AM and VDL Mode 3 unless otherwise noted. The following pages describe the Analysis test cases in Figure 8.

The analysis documentation is to be supplied in one or both of the following two formats as stipulated in the individual analysis test cases:

Data Analysis Report – Each Data Analysis Report must contain the following:

a. A listing of the test equipment.
b. A listing of the MDR equipment (including hardware and software versions).
c. The test setup, equipment settings, and test procedures.
d. Reduced test data and methods for reduction.
e. Any Certificates of Compliance from certified independent test facilities.
f. A summary of how the data supports compliance to the requirement.

White Paper – Each White Paper must contain the following:

a. An introduction with reference to the requirements being addressed.
b. A detailed discussion on the MDR design as applicable to the associated requirement(s). Drawings and technical data should be included.
c. A summary that specially addresses how the design meets the associated requirement(s).

1. A833 Objectives: The objective of the A833 test case is to verify by review of Offeror documentation that the MDRs meet the 8 1/3kHz capability in accordance with ETSI Specification EN-300-676. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	4	A			

2. A833 Test Criteria: The MDR meets the requirement (shall) stated above.

3. A833 Test Approach: The Offeror is to supply a Data Analysis Report that details the MDRs compliance to the criteria above. The requirements contained in EN-300-676 (excluding sections 4.4 and 5) are to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply. The MDR version tested for this test case must be the same as the OCT MDR version.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained in EN-300-676 and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must provide the supporting data if a more stringent requirement is met.

The FAA will review the Data Analysis Report for completeness, technical accuracy, validity, and compliance with the requirements.

4. A833 Data Analysis Methods: Not Applicable.

1. AANC Objectives: The objective of the AANC test case is to verify by review of Offeror documentation that the MDRs meet the acoustical noise requirement. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	275	A			

2. AANC Test Criteria: The MDR meets the requirement (shall) stated above.

3. AANC Test Approach: The Offeror is to supply a Data Analysis Report that details the MDRs compliance to meet the acoustical noise requirement above.

Each requirement contained in FAA-G-2100, section 3.3.6.1, Subsection c is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained in FAA-G-2100, Section 3.3.6.1, Subsection c and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the FAA-G-2100, Section 3.3.6.1, Subsection c requirement is met.

The FAA will review the Data Analysis Report for completeness, technical accuracy, validity, and compliance with the requirements of FAA-G-2100, Section 3.3.6.1, Subsection c.

4. AANC Data Analysis Methods: Not Applicable.

1. AARG Objectives: The objective of the AARG test case is to verify by review of Offeror documentation that the MDRs meet the adjustment range requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	300 and 301	A			

2. AARG Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AARG Test Approach: The Offeror is to supply a White Paper that details the MDR's compliance to the criteria above. Each requirement is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. Design detail to support the compliance to the requirement is to be provided.
b. For any requirement that is not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the requirement is met.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. AARG Data Analysis Methods: Not Applicable.

1. AATR Objectives: The objective of the AATR test case is to verify by review of Offeror documentation that the MDRs meet the VDL Mode 3 ATR requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	374*	A	FAA-E-2938	693	A
FAA-E-2938	380	A	FAA-E-2938	677*	A
FAA-E-2938	620	A	FAA-E-2938	697**	A
FAA-E-2938	621*	A	FAA-E-2938	698	A

**Only the VDL Mode 3 portion of the requirement applies to this test case. Also see SATR*
***Only the VDL Mode 3 portion of the requirement applies to this test case. Also see TAKY.*

2. AATR Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AATR Test Approach: The Offeror is to supply a Data Analysis Report that details the MDR's compliance to the criteria above. Each requirement is to be individually addressed as to whether the MDR's (15 watt transmitter and 50 watt transmitter) do or do not comply. The MDR version tested for this test case must be the same as the OCT MDR version.

a. For all requirements that are met by the MDR, detailed test data, proving that the requirement is met, is to be provided. MDR design detail and technical data to support the compliance to the requirement may also be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.

The FAA will review the Data Analysis Report for completeness, technical accuracy, validity, and compliance with the requirements.

4. AATR Data Analysis Methods: Not Applicable.

1. AEMC Objectives: The objective of the AEMC test case is to verify by review of Offeror documentation that the MDRs conform to the electromagnetic compatibility requirement. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	352	A			

2. AEMC Test Criteria: The MDR meets the requirement (shall) stated above.

3. AEMC Test Approach: The Offeror is to supply a Data Analysis Report from in-house testing or a certified independent test facility that details the MDRs compliance to meet the EMC requirements of MIL-STD-461, as stated above. The MDR version tested for this test case must be the same as the OCT MDR version.

a. If the MDR does not comply with a requirement, then no further details are requested. The CRP process handles all discussions for non-compliance.
b. If there is a conflict between a requirement contained in MIL-STD-461 and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the MIL-STD-461 requirement is met.

The FAA will review the Data Analysis Report for completeness, technical accuracy, validity, and compliance with the requirements of MIL-STD-461 and FAA-E-2938.

4. AEMC Data Analysis Methods: Not Applicable.

1. AENV Objectives: The objective of the AENV test case is to verify by review of Offeror documentation that the MDRs conform to the specified environmental requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	267 and 268	A	FAA-E-2938	345 through 347	A

2. AENV Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AENV Test Approach: The following two approaches are required for this test case:

a. The Offeror is to supply a White Paper that details how the MDR is compliant to Shalls #267 and #268. Each requirement is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

   1) For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. As applicable, design detail to support the compliance to the requirement is to be provided.
   2) For any requirement that is not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
   3) If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.

   The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

b. The Offeror is to supply a Data Analysis Report from in-house testing or a certified independent test facility that details the MDRs compliance to meet the environmental requirements, Shalls #345 through #347. The MDR version tested for this test case must be the same as the OCT MDR version.

   1) Each requirement contained in item c is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.
   2) For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
   3) If the MDR does not comply with a requirement, then no data or other documentation is required for that requirement. The CRP process handles all discussions for non-compliance.

   The FAA will review the Data Analysis Report for completeness, technical accuracy, validity, and compliance with the requirements.

4. AENV Data Analysis Methods: Not Applicable

1. AESD Objectives: The objective of the AESD test case is to verify by review of Offeror documentation that the MDRs conform to electrostatic discharge (ESD) and transient protection requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	331	A	FAA-E-2938	337 and 338	A

2. AESD Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AESD Test Approach: The Offeror is to supply a White Paper that details the MDR's compliance to the criteria above. Each requirement is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained in FAA-G-2100, FAA-STD-020 or IEEE/ANSI, and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the associated requirement is met.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. AESD Data Analysis Methods: Not Applicable.

1. AGBS Objectives: The objective of the AGBS test case is to review Offeror documentation that addresses the MDRs compliance to FAA-STD-020. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	273	A			

2. AGBS Test Criteria: The MDR meets the requirement (shall) stated above.

3. AGBS Test Approach: The Offeror is to supply a White Paper that details the MDR's compliance to the criteria above. Each requirement is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided. For broad-ranging requirements, details on design and manufacturing processes and procedures, which ensure compliance, may be discussed.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained in FAA-STD-020 and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the associated requirement is met.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. AGBS Data Analysis Methods: Not Applicable.

1. AHPE Objectives: The objective of the AHPE test case is to verify by review of Offeror's documentation that the MDRs conform to the human performance and human engineering requirements. Included are the thermal contact hazard requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	292	A	FAA-E-2938	351	A

2. AHPE Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AHPE Test Approach: The Offeror is to supply a White Paper that details the MDR's compliance to the criteria above. Each requirement contained in FAA-G-2100, Section 3.3.6, the FAA HFDG, and FAA-E-2938 Section 3.4.3.3 c) is to be reviewed by the Offeror. However, the Offeror is to identify only those requirements in the Human Factors Design Guide that are applicable to the MDR design. For the applicable requirements that have been identified, the following rules apply:

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail and technical data to support the compliance to the requirement is to be provided, as applicable. For broad-ranging requirements, details on design and manufacturing processes and procedures, which ensure compliance, may be discussed.
b. If the MDR does not comply with a requirement, then no further discussion is requested. All discussions for non-compliance are handled by the CRP process.
c. If there is a conflict between a requirement contained in FAA-G-2100, Section 3.3.6, or the FAA HFDG, and any requirement of FAA-E-2938, then FAA-E-2938 takes precedence. The nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. AHPE Data Analysis Methods: Not Applicable.

1. ALOF Objectives: The objective of the ALOF test case is to verify by review of Offeror documentation that the MDRs meet the reference frequency requirements for both the transmitters and the receiver. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	47	A	FAA-E-2938	444	A
FAA-E-2938	152	A	FAA-E-2938	446	A
FAA-E-2938	393	A	FAA-E-2938	651 and 652	A
FAA-E-2938	395	A			

2. ALOF Test Criteria: The MDR meets the requirements (shalls) stated above.

3. ALOF Test Approach: The Offeror is to supply a Data Analysis Report that details the MDR's compliance to the referenced criteria above. Each requirement pertaining to the MDR is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply. The MDR version tested for this test case must be the same as the OCT MDR version.

a. For all requirements that are met by the MDR, the detailed test data on how the requirement is met are to be provided in the report. MDR design detail and technical data to support the compliance to the requirement may also be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no data or other documentation is required for that requirement. The CRP process handles all discussions for non-compliance.

The FAA will review the Data Analysis Report for completeness, technical accuracy, validity, and compliance with the requirements.

4. ALOF Data Analysis Methods: Not Applicable.

1. AMAC Objectives: The objective of the AMAC test case is to verify by review of Offeror documentation that the MDRs meet the VDL Mode Protocol requirements of DO-224a. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	9*	A	FAA-E-2938	12 and 13	A

**All applicable requirements are to be addressed in the analysis document. Note that ramp-up and ramp-down times are also verified in TVRF.*

2. AMAC Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AMAC Test Approach: The Offeror is to supply a White Paper that details the MDRs compliance to the criteria above. Each requirement contained in RTCA DO-224a is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

   a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
   b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
   c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
   d. If there is a conflict between a requirement contained in RTCA DO-224a and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the RTCA DO-224a requirement is met.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. AMAC Data Analysis Methods: Not applicable.

1. AMAP Objectives: The objective of the AMAP test case is to verify by review of Offeror's documentation that the MDRs contain the necessary hardware and software to detect alarm conditions and prevent spurious alarms.

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	587 through 589	A			

2. AMAP Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AMAP Test Approach: The Offeror is to supply a White Paper that details the MDRs compliance to the criteria above. Each criterion is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail to support the compliance to the requirement is to be provided, as applicable.
b. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. AMAP Data Analysis Methods: Not Applicable

1. AMMD Objectives: The objective of the AMMD test case is to verify by review of Offeror documentation that the MDRs meet the modulation method requirements.

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	17	A			

2. AMMD Test Criteria: The MDR meets the requirement (shall) stated above.

3. AMMD Test Approach: The Offeror is to supply a Data Analysis Report that details the MDR's compliance to the referenced criteria above. Each requirement pertaining to the MDR is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply. The MDR version tested for this test case must be the same as the OCT MDR version.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained in CFR 47, Part 2 and Part 87, and the NTIA, Regulations and Procedures for Federal Radio Frequency Management (Chapter 6, paragraph 6.3), and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the CFR 47, Part 2 and Part 87, and the NTIA, Regulations and Procedures for Federal Radio Frequency Management (Chapter 6, paragraph 6.3) requirements are met.

The FAA will review the Data Analysis Report for completeness, technical accuracy, validity, and compliance with the requirements.

4. AMMD Data Analysis Methods: Not Applicable.

1. AMPP Objectives: The objective of the AMPP test case is to verify by review of Offeror documentation that the MDRs conform to the material, processes, and parts requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	278 through 280	A	FAA-E-2938	285 through 288	A

2. AMPP Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AMPP Test Approach: The Offeror is to supply a White Paper that details the MDR's compliance to the criteria above. Each requirement is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

a. For all requirements that are met by the MDR, the details on how the requirements met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained in FAA-G-2100, MIL-STD-889, EIA standards, and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the associated requirement is met.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. AMPP Data Analysis Methods: Not Applicable.

1. AMTB Objectives: The objective of the AMTB test case is to verify by review of Offeror documentation that the MDRs meet the MTBF, MTTR, and maintainability requirements. This test case will also verify periodic maintenance and service life requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	353 through 355	A	FAA-E-2938	363 through 365	A
FAA-E-2938	357	A			

2. AMTB Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AMTB Test Approach: The Offeror is to supply a White Paper that details the MDRs compliance to the criteria above. Each criterion is to be individually addressed as to whether the MDR does or does not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. As applicable, design detail to support the compliance to the requirement is to be provided. For MTBF, MTTR, periodic maintenance intervals, and service life calculations, the background material, formulas, and other documentation used to support the calculations are to be provided.
b. For any requirement that is not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. AMTB Data Analysis Methods: Not Applicable.

1. ARAV Objectives: The objective of the ARAV test is to verify the average audio output requirement of the receiver. The following requirement will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	680	A			

2. ARAV Test Criteria: The MDR meets the requirement (shall) stated above.

3. ARAV Test Approach: The Offeror is to supply a White Paper that details how the receiver design is compliant to the criteria above. Each criterion is to be individually addressed as to whether the MDR does or does not comply.

   a. If the requirement is met by the MDR, the details on how the requirement is met are to be provided. As applicable, design detail to support the compliance to the requirement is to be provided.
   b. If this requirement is not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
   c. If the MDR does not comply with this requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirement.

4. ARAV Data Analysis Methods: N/A.

1. ARCP Objectives: The objective of the ARCP test is to verify that the receiver meets the VDL Mode 3 symbol rate capture range requirement. The following requirement will be evaluated by this test.

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	87	A			

2. ARCP Test Criteria: The MDR meets the requirement (shall) stated above.

3. ARCP Test Approach: The Offeror is to supply a Data Analysis Report which provides detailed test data proving that the MDR receiver meets the above symbol rate capture range requirement. The MDR version tested for this test case must be the same as the OCT MDR version.

If the receiver does not meet the above requirement, then no data or other documentation is required. The CRP process handles all discussions for non-compliance.

The FAA will review the Data Analysis Report for completeness, technical accuracy, validity, and compliance with the requirement.

4. ARCP Data Analysis Methods: Not applicable.

1. ARDP Objectives: The objective of the ARDP test is to verify that the receiver meets the doppler rate requirements. The following requirements will be evaluated by this test.

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	89	A	FAA-E-2938	370	A

2. ARDP Test Criteria: The MDR meets the requirements (shalls) stated above.

3. ARDP Test Approach: The Offeror is to supply a Data Analysis Report which provides detailed test data proving that the MDR receiver meets the above doppler rate requirements. The MDR version tested for this test case must be the same as the OCT MDR version.

If the receiver does not meet one of the above requirements, then no data or other documentation is required for that requirement. The CRP process handles all discussions for non-compliance.

The FAA will review the Data Analysis Report for completeness, technical accuracy, validity, and compliance with the requirement.

4. ARDP Data Analysis Methods: Not Applicable.

1. ARIR Objectives: The objective of the ARIR test is to verify the image rejection requirements of the receiver. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	39 and 40	A			

2. ARIR Test Criteria: The MDR meets the requirements (shalls) stated above.

3. ARIR Test Approach: The Offeror is to supply a White Paper which provides detailed design information proving that the MDR receiver meets the above image frequency criteria. Each criterion is to be individually addressed as to whether the MDR receiver does or does not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirement.

4. ARIR Data Analysis Methods: Not Applicable.

1. ARPM Objectives: The objective of the ARPM test case is to verify by review of Offeror documentation that the MDR receivers meet the power measurement requirements for VDL Mode 3 and DSB-AM.

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	631 through 634	A	FAA-E-2938	667	A

2. ARPM Test Criteria: The MDR meets the requirements (shalls) stated above.

3. ARPM Test Approach: The Offeror is to supply a White Paper which provides detailed design information proving that the MDR receiver meets the above power measurement criteria. Each criterion is to be individually addressed as to whether the MDR receiver does or does not comply.

If the receiver does not meet one of the above requirements, then no other documentation is required for that requirement. The CRP process handles all discussions for non-compliance.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirement.

4. ARPM Data Analysis Methods: Not Applicable.

1. ARSQ Objectives: The objective of the ARSQ test is to verify the squelching system designed into the receiver. The following requirements will be evaluated by this test.

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	64	A	FAA-E-2938	70	A
FAA-E-2938	68 and 69	A	FAA-E-2938	72	A

2. ARSQ Test Criteria: The MDR meets the requirements (shalls) stated above.

3. ARSQ Test Approach: The Offeror is to supply a White Paper which provides detailed design information proving that the MDR receiver meets the above squelch requirements. Each criterion is to be individually addressed as to whether the MDR receiver does or does not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirement.

4. ARSQ Data Analysis Methods: Not Applicable.

1. AS&V Objectives: The objective of the AS&V test case is to verify by review of Offeror documentation that the MDRs meet the shock and vibration requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	269 through 272	A			

2. AS&V Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AS&V Test Approach: The Offeror is to supply a Data Analysis Report from a certified independent test facility or from in-house testing that details the MDRs compliance to meet the shock and vibration requirements of MIL-STD-810 as stated above. Each requirement is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply. The MDR version tested for this test case must be the same as the OCT MDR version.

a. For all requirements that are met by the MDR, detailed test data is to be provided. MDR design details in support of the requirement may also be provided.
b. If the MDR does not comply with a requirement, then no further test data or documentation is requested. The CRP process handles all discussions for non-compliance.
c. If there is a conflict between a requirement contained in MIL-STD-810 and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement “Shall” number needs to be provided. The Offeror must still provide supporting data if the MIL-STD-810 requirement is met.

The FAA will review the Data Analysis Report for completeness, technical accuracy, validity, and compliance with the requirements of MIL-STD-810 and FAA-E-2938.

4. AS&V Data Analysis Methods: Not Applicable.

1. ASAF Objectives: The objective of the ASAF test case is to verify by review of Offeror documentation that the MDRs conform to the personnel and equipment safety requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	290 and 291	A	FAA-E-2938	676	A

2. ASAF Test Criteria: The MDR meets the requirements (shalls) stated above.

3. ASAF Test Approach: The Offeror is to supply a White Paper that details the MDRs compliance to the criteria above. Each requirement is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained in FAA-G-2100, the FAA Human Factors Guide, and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement “Shall” number needs to be provided. The Offeror must still provide supporting data if the associated requirement is met.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. ASAF Data Analysis Methods: Not Applicable.

1. ASPC Objectives: The objective of the ASPC test case is to verify by review of Offeror documentation that the MDRs conform to the software and processor capability requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	19 through 23	A			

2. ASPC Test Criteria: The MDR meets the requirements (shalls) stated above.

3. ASPC Test Approach: The Offeror is to supply a White Paper that details the MDR's compliance to the criteria above. Each requirement is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

   a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
   b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
   c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. ASPC Data Analysis Methods: Not Applicable.

1. ASSC Objectives: The objective of the ASSC test case is to verify by review of Offeror documentation that the MDRs meet various security requirements of FAA-E-2944 and FAA-E-2938.

Document	Shall #/Par.	Method	Document	Shall #	Method
FAA-E-2944	3.3 b), c), d)	A	FAA-E-2938	528	A
FAA-E-2938	513 through 516	A			

2. ASSC Test Criteria: The MDR meets the requirements (shalls) stated above.

3. ASSC Test Approach: The Offeror is to supply a White Paper that details the MDR's compliance to each of the criteria above. Each requirement addressed above is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained in FAA-E-2944, FIPS 186-2, FIPS 140-1 and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the requirement is met.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. ASSC Data Analysis Methods: Not Applicable.

1. AT1L Objectives: The objective of the AT1L test case is to verify by review of Offeror documentation that the MDR is compliant with the T1 Line requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
NAS-IC-41033502	217	A	NAS-IC-41033502	220 and 221	A

2. AT1L Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AT1L Test Approach: The Offeror is to supply a White Paper that details the MDR's compliance to the criteria above. Each requirement contained is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained in ITU-T Recommendation G.824 and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the requirement is met.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. AT1L Data Analysis Methods: Not Applicable.

1. AT1P Objectives: The objective of the AT1P test case is to verify by review of Offeror documentation that the MDR is compliant with the fractional T1 protocol defined in ANSI T1.403-1995. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
NAS-IC-41033502	209	A	FAA-E-2938	426	A

2. AT1P Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AT1P Test Approach: The Offeror is to supply a White Paper that details the MDR's compliance to the criteria above. Each requirement contained in ANSI T1.403-1995 is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained in ANSI T1.403-1995 and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the ANSI T1.403-1995 requirement is met.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. AT1P Data Analysis Methods: Not Applicable.

1. AVPM Objectives: The objective of the AVPM test is to verify that the MDR meets voice vs. monitoring priority requirements. The following requirements will be evaluated by this test.

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	101	A	FAA-E-2938	635 and 636	A
FAA-E-2938	174 and 175	A			

2. AVPM Test Criteria: The MDR meets the requirements (shalls) stated above.

3. AVPM Test Approach: The Offeror is to supply a White Paper which provides detailed design information proving that the MDR meets the above priority requirements. Each criterion is to be individually addressed as to whether the MDR does or does not comply.

   a. For the requirements, the design details on how the requirements are met by the MDR are to be provided.
   b. If the MDR does not comply with a requirement, then no further discussion is required. The CRP process handles all discussions for non-compliance.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirement.

4. AVPM Data Analysis Methods: Not Applicable.

1. AWRK Objectives: The objective of the AWRK test case is to review Offeror documentation that addresses compliance with the workmanship requirement. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	239	A			

2. AWRK Test Criteria: The MDR meets the requirement (shall) stated above.

3. AWRK Test Approach: The Offeror is to supply a White Paper that details the MDR's compliance to the criteria above. Each requirement is to be individually addressed as to whether the MDRs (receiver, 15 watt transmitter, and 50 watt transmitter) do or do not comply.

a. For all requirements that are met by the MDR, the details on how the requirement is met are to be provided. MDR design detail, technical data, and especially test data to support the compliance to the requirement is to be provided.
b. For any requirements that are not applicable to the MDR design, or any future design, a specific reason for why the requirement is not applicable needs to be provided.
c. If the MDR does not comply with a requirement, then no further discussion is requested. The CRP process handles all discussions for non-compliance.
d. If there is a conflict between a requirement contained in FAA-G-2100, MIL-HDBK-454 and any requirement of FAA-E-2938, the nature of the conflict and the FAA-E-2938 requirement "Shall" number needs to be provided. The Offeror must still provide supporting data if the associated requirement is met.

The FAA will review the White Paper for completeness, technical accuracy, validity, and compliance with the requirements.

4. AWRK Data Analysis Methods: Not Applicable.

APPENDIX B6 - DEMONSTRATION TEST CASES

Offeror Demonstration Descriptions: The MDR Demonstration Cases as depicted in Figure 9 will focus on Offeror demonstrations of selected MDR system features and monitoring and control functions of the MDR from the MDT. The Offeror demonstration phase provides the MDR Offeror the ability to demonstrate their equipment's compliance to the listed set of requirements.

General instructions for the planning and conduct of the demonstration phase are provided herein:

- The Demonstration cases will be executed through an Offeror-conducted demonstration of the case specific MDR and MDT functions utilizing the Offeror's NEXCOM subsystem.

- The demonstration will be conducted using the MDRs and Offeror MDT software supplied for the OCT on the Government furnished MDT hardware platform.

- The Offeror will install their MDR application software on the MDT before conduct of the demonstration.

- Should specialized equipment be required, the Offeror will supply this equipment and identify its use in the demonstration scripts.

- All Offeror test equipment used for the demonstrations must be calibrated and proof of valid/current calibration should be available to the OCT Test Team.

- The Offeror demonstration will be performed at the FAA WJHTC during the predefined Offeror's OCT periods using demonstration scripts prepared by the Offeror and submitted as part of their "Submission for OCT".

- Each Demonstration Case contains a suggested "verification approach" of the specified requirements as an aid in the development of the demonstration scripts. However, the verification approach content contained in the scripts is the responsibility of the Offeror.

- Copies of the demonstration scripts will be provided to the OCT Test Team to follow the demonstration.

- Deviations to the scripts will be accepted as long as they are documented and signed by the OCT Test Coordinator and the Offeror's Lead OCT Representative conducting the demonstration.

- The OCT Test Team will retain a signed copy of the demonstration scripts at the conclusion of the demonstration. One signed copy will be provided to the Offeror.

- The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step.

- During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated.

- After the Offeror demonstrations are conducted, the OCT Test Team, without the Offeror's assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated.
- Applicable compliance criteria will be recorded through the Requirements Compliance Report (RCR), i.e. evaluation report and coordinated with the NEXCOM MDR TET.
- All OCT Test Team notes resulting from the Offeror Demonstrations will be collected and provided to the TET in support of proposal evaluations.

Sample Form: Template for Demonstration Script

Step No.	Verified Requirement (Shall number and Shall text)	Procedural Step	Expected Outcome	Witnessed Expected Outcome		Comment Field
				Yes	No	

Definitions:

Step No: An integer count of the number of steps in each demonstration script beginning with "1".

Verified Requirement: The Shall # and Shall text (requirement) of the FAA-E-2938, FAA-E-2944, and/or NAS-IC-41033502 to which the procedural step and expected outcome can be traced for requirement verification.

Procedural Step: Detailed description of the verification process, the settings of the MDR under demonstration, any particular external equipment used for the demonstration, command functions, input values, data tables, etc… invoked in support of the expected outcome.

Expected Outcome: The anticipated result of the actions invoked through the following of the procedural steps.

Witnessed Expected Outcome: Checkmark field to document whether the expected outcome was demonstrated.

Comment Field:	Field provided to add comments and/or to clarify steps as a result of the conduct of the demonstration.

1. DBIT Objectives: The objective of the DBIT test case is to verify that the Offeror has provided the FAA with access to any MDR Built In Tests (BITs). The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	211	D			

2. DBIT Test Criteria: The MDR will successfully pass the DBIT test case if the Offeror can demonstrate that they have provided the FAA access to all BITs.

3. DBIT Test Approach:

DBIT will consist of a Offeror demonstration that clearly shows how transmitter and receiver BITs are accessible to the FAA. DBIT will be conducted upon a 15 watt transmitter configured in DSB-AM mode and repeated when the transmitter is configured for VDL Mode 3. Likewise, the DBIT will be conducted upon a receiver configured in DSB-AM mode and repeated when the receiver is configured for VDL Mode 3.

4. DBIT Data Analysis Methods:

The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror's assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET.

1. DMAP Objectives: The objective of the DMAP test case is to verify that the MDR meets the alarm and alert processing requirements via the MDT. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	158**	D	FAA-E-2938	530	D
FAA-E-2938	176*	D	FAA-E-2938	531	D
FAA-E-2938	177	D	FAA-E-2938	586	D
FAA-E-2938	179	D	FAA-E-2938	666*	D
FAA-E-2938	180	D	FAA-E-2938	672	D
FAA-E-2938	182	D	FAA-E-2944	19 through 21	D
FAA-E-2938	184 through 191	D	FAA-E-2944	29 through 33	D
FAA-E-2938	193	D	FAA-E-2944	45 and 46	D

**The RIU portion of this requirement(s) is not demonstrated by this test case.*

****This requirement is also verified by DMMR and DMCP.*

2. DMAP Test Criteria: The MDR will successfully pass the DMAP test case if the Offeror can demonstrate that they have provided:

a. An MDR that accepts control input, provides control replies, monitoring output and alert/alarm indications via the MDT connector (158).

b. Suppression of alarm and alert status messages to the MDT upon command (176), send alert event acknowledging the command to suppress alarm and alert status messages before suppressing alarm and alert radio monitoring messages (177).

c. A three state description (normal, alert, and alarm) for MDR parameters with adjoining range of values (179 and 180).

d. State changes determined by data comparison to pre-established thresholds (182).

e. System monitoring functions that declare alert events (once per occurrence: PRI field set to 1) (184 and 185), return to normal alert events (once per occurrence: PRI field set to 0) (186 and 187), alarm events (once per occurrence: PRI field set to 2) (188 and 189), and state change events (once per occurrence with PRI field set to 1) (190 and 191).

f. Unsolicited radio monitoring message notification within 4 seconds of alarm/alert occurrence (193).

g. Front panel visual indicator (530) displays of red (for failed state indication) yellow (alert state), yellow-flashing (alarm state), green (offline and/or online states) and green-flashing (recovery state).

h. Visual indications for failure, alarm and alerts remain displayed (531) until conditions are cleared by a return-to-normal.

i. The monitored parameters change states when their values transition from one range to another (586).

j. Automatic detection and reporting of critical equipment failures to the local access point when the MDR is in Offline and Online states and during Recovery (666).

k. Visual indicators viewable for at least +/- 60 degrees off horizontal or vertical axis and clearly visible from a distance of 10 feet in a brightly lit room (672).

The MDTS will successfully pass the DMAP test case if the Offeror can demonstrate that they have provided:

l. The ability for the operator to read alert and alarm threshold values (2944-19) and independently change of alert/alarm thresholds (2944-20).

m. Error message generation for any attempt to set minimum thresholds equal to or greater than the maximum threshold (2944-21).

n. Storage (2944-29) of at least 9 alarm/alert threshold sets.

o. Editing (2944-30) of alarm/alert threshold values.

p. Download from the MDR (2944-31) the alarm/alert threshold set and apply the operator-selected file name or label.

q. Upload (2944-32) of alarm/alert threshold set(s) upon operator command and verification (2944-33) of each alarm/alert threshold setting before indicating a successful upload.

r. Audible alert functions via a MDT generated tone (2944-45, 2944-46) when a selected parameter achieves min/max values and when an operator-selected parameter crosses high and/or low threshold.

3. <u>DMAP Test Approach:</u> The DMAP test case will be executed through an Offeror-conducted demonstration of alarm and alert processing functions. One receiver and one 15 watt transmitter will be required for the demonstration.

Configure the 15 watt transmitter for DSB-AM mode. Demonstrate the applicable alert and alarm states are available in AM mode.

- Connect the MDT to the MDR to review the transfer of alarm and alert messages (158, 2944-19) and alarm and alert parameter modifications (2944-20, 2944-30). Using the MDT, review the MDTS features to download alarm/alert threshold sets with operator-applied file names (2944-31). Conduct an alarm/alert threshold set upload (2944-32) and ascertain its verification (2944-33) status. Afterwards, display the storage capabilities for alarm and alert threshold sets (2944-29).

- **Online state**: Place the MDR in the Online state (666). Create an alarm and alert event resulting in receipt of an unsolicited radio monitoring message (193). Record whether this message was received within 4 seconds of the establishment of the alarm and alert event. Document whether an audible-alert message was provided via the MDT (2944-45, 2944-46). Clear this event through operator intervention and return-to-normal. Again, create this alarm and alert event, but first suppress delivery of the alarm and alert status message to the MDT (176) and record the receipt of the alarm and alert suppression message (177). Again, clear this event through operator intervention and return-to-normal. Select and modify a parameter in an attempt to set a minimum threshold equal to or greater than the maximum threshold. Record whether an error message was generated (2944-21) and an audible-alert message was provided via the MDT (2944-45, 2944-46) as a result of this action.

    - While remaining in the Online state, the operator will demonstrate implementation of the front panel visual indicators for alarm and alert events (530, 531). Record whether a display of red (for failed state or failure event indication) yellow (alert state), yellow-flashing (alarm state), green (offline and/or online states) and green-flashing (recovery state) were generated. These indicators will be reviewed to determine their visibility in the work environment (672).

- **Offline state**: Place the MDR in the Offline state (666). Create an alarm and alert event resulting in receipt of an unsolicited radio monitoring message (193). Record whether this message was received within 4 seconds of the establishment of the alarm and alert event. Document whether an audible-alert message was provided via the MDT (2944-45, 2944-46). Clear this event through operator intervention and return-to-normal. Again, create this alarm and alert event, but first suppress delivery of the alarm and alert status message to the MDT (176) and record the receipt of the alarm and alert suppression message (177). Again, clear this event through operator intervention and return-to-normal. Select and modify a parameter in an attempt to set a minimum threshold equal to or greater than the maximum threshold. Record whether an error message was generated (2944-21) and an audible-alert message was provided via the MDT (2944-45, 2944-46) as a result of this action.

    - While remaining in the Offline state, the operator will demonstrate implementation of the front panel visual indicators for alarm and alert events (530, 531). Record whether a display of red (for failed state or failure event indication) yellow (alert state), yellow-flashing (alarm state), green (Offline and/or online states) and green-flashing (recovery state) were generated. These indicators will be reviewed to determine their visibility in the work environment (672).

- **Recovery State**: Initiate a Recovery state condition (666). Ascertain through the MDT which alarm and alert event functions are available in this mode (666). **Select an alarm and alert event from those available.** Create an alarm and alert event resulting in receipt of an unsolicited radio monitoring message (193). Record whether this message was received within 4 seconds of the establishment of the alarm and alert event. Document whether an audible-alert message was provided via the MDT (2944-45, 2944-46). Clear this event through operator intervention and return-to-normal. **If available,** demonstrate the availability to suppress alarm and alert message event delivery and acknowledgement messages (176, 177). **If available**, select and modify a parameter in an attempt to set a minimum threshold equal to or greater than the maximum threshold. Record whether an error message was generated (2944-21) and an audible-alert message was provided via the MDT (2944-45, 2944-46) as a result of this action.

    - While in the Recovery state, the operator will demonstrate implementation of the front panel visual indicators for alarm and alert events (530, 531). Record whether a display of red (for failed state or failure event indication) yellow (alert state), yellow-flashing (alarm state), green (Offline and/or online states) and green-flashing (recovery state) were generated. These indicators will be reviewed to determine their visibility in the work environment (672).

Configure the 15 watt transmitter for VDL Mode 3. Demonstrate the applicable alert and alarm states are available in VDL Mode 3.

Configure the MDR receiver for DSB-AM mode. Demonstrate the applicable alert and alarm states are available in AM mode.

Configure the MDR receiver for VDL Mode 3. Demonstrate the applicable alert and alarm states are available in VDL Mode 3.

Successful conduct of the demonstration should ensure alerts and alarms were provided with three state descriptions (179, 180), events were noted upon transitioning across pre-determined thresholds (586), declared (184-191), and based on data comparison processes (182).

4. <u>DMAP Data Analysis Methods</u>: The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror's assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET.

1. DMCP Objectives: The objective of the DMCP test case is to verify the MDR control parameter attributes from the MDT for both the transmitter and receiver. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	24	D	FAA-E-2938	472*****	D
FAA-E-2938	26***	D	FAA-E-2938	473 though 482*	D
FAA-E-2938	48*******	D	FAA-E-2938	532*	D
FAA-E-2938	52	D	FAA-E-2938	571	D
FAA-E-2938	53***	D	FAA-E-2938	576**	D
FAA-E-2938	54 through 56	D	FAA-E-2938	581 and 582	D
FAA-E-2938	67***	D	FAA-E-2938	583 and 584*	D
FAA-E-2938	157***	D	FAA-E-2938	670	D
FAA-E-2938	158**	D	FAA-E-2938	673	D
FAA-E-2938	163	D	FAA-E-2938	694*	D
FAA-E-2938	452	D	FAA-E-2938	696	D
FAA-E-2938	454*	D	FAA-E-2944	10**	D
FAA-E-2938	455 through 457****	D	FAA-E-2944	16 through 18	D
FAA-E-2938	458 through 463*	D	FAA-E-2944	22 through 28	D
FAA-E-2938	464******	D	FAA-E-2944	34 through 37	D
FAA-E-2938	465 through 471*	D			

**RIU interface not demonstrated by this test case. Also see IMCP.*

***Only partially verified by this test case. Also see DMMR.*

****The RIU portion of this requirement will not be demonstrated by this Test Case.*

*****Partially demonstrated by this test case. Also see DSTU and IMCP.*

******Partially demonstrated by this test case. Also see DMTT and IMCP.*

*******Partially demonstrated by this test case. Also see DMPO and IMCP.*

********Partially demonstrated by this test case. Also see RAAC.*

2. DMCP Test Criteria: The MDR will successfully pass the DMCP test case if the following can be accomplished from the MDT:

a. The MDR receiver and transmitter revert to their previous version of software and restart, if the MDR does not successfully restart after receipt and execution of the Switch Software Version control parameter command (24).

b. Audio level control and mute activation/deactivation (53) locally from the MDT (26), mute control inputs (52), selectable mute attenuation levels (54) and default settings (56) measurable within +/- 3 dB (55) of the set levels in dB (0 (no mute), 15, 20, and no audio).

c. A 0.5 dB step size adjustments between –25 dBm and +20 dBm for audio output level of MDR receiver (48). *Note: Using an RF input of –87dBm carrier, AM modulated 30%, 1004 Hz tone.*

d. Squelch adjustment provided for control of squelch sensitivity via MDT (67).

e. Control functions that support real-time system management actions from the MDT when the MDR is in Online and Offline states (157).

f. MDR accepts control input, provides control replies, monitoring output and alert/alarm indications via the MDT connector (158).

g. Control parameter modifications summarized in FAA-E-2938, Table 3-3 (163).

h. Control parameter adjustments set to within associated monitoring parameter tolerances (452).

i. Control parameters applicable to MDR receiver and MDR transmitter are in accordance with FAA-E-2938, Sections 3.2.3.2.1 a) through 3.2.3.2.34 a), except for the bit formats (454 through 482, 532, 583-584, and 694).

j. The transfer of a control reply message should a software upload be rejected (571).

k. Local control and monitoring by interface and interoperation with the MDT (576).

l. The ability to modify all control parameters (per FAA-E-2938, Table 3-3) when in the Offline state (581).

m. When in the Online state, the MDR rejects all control parameter commands except the following: (582)

   1 Log In
   5 MDR State
   6 Alarm/Alert Threshold Setting
   8 Squelch RF Threshold Level Setting
   9 Squelch Audio Signal to Noise Threshold Level Setting
   11 Receiver Mute
   13 Transmitter Modulation
   14 ATR Switch State
   20 Transition Timeout
   21 Squelch Enable/Disable
   30 Request Read Back
   34 MAC Timing Offset Correction
   35 Suppress Alarm/Alert
   36 Reset
   37 Software Upload Enable/Disable
   38 Software Upload.

n. Squelch audio signal-to-noise level settings (583) in accordance with the specified requirements.

o. T2 link re-transmission timer (584) in accordance with the specified requirements.

p. The receiver mutes audio when either the control parameter of the input from the Receiver remote connector indicate audio muting and unmutes when both indicate unmute (670).

q. Active front panel local audio when MDR receiver is generating analog audio (673).

r. Receiver provides a confirmation signal via the Receiver remote connector for the duration of the mute (696).

The MDTS will successfully pass the DMCP test case if the following can be accomplished from the MDT:

s. Display of operator selected monitored and control parameters as listed in FAA-E-2938, Table 3-3 and Table 3-4 (2944-10).

t. The operator is allowed to change control parameter values (2944-16), update the display (2944-17) of the control parameter value, and display any error message(s) generated (2944-18) with respect to control parameter change.

u. Storage of at least 15 parameter sets with operator selectable labels (2944-22).

v. Control parameter editing (2944-23).

w. Operator commanded downloads of control parameter value and file storage (2944-24).

x. Operator commanded uploads of control parameter value sets (2944-25) and value set verification (2944-26).

y. Allow storage and retrieval via floppy disk (2944-27).

z. Allows for each control parameter set (for uploading) contain all, or a subset of, the control parameters (2944-28).

aa. Storage of at least 4 operating software sets (2944-34) for upload/download.

bb. Operating software contains a set of code (2944-35).

cc. Upload operator selected software set upon double-verified operator command (2944-36).

dd. Display of digital signature authentication result (2944-37) after operating software set download.

3. <u>DMCP Test Approach</u>:

The demonstration will be conducted on one 15 watt transmitter and one receiver. The MDT will be connected and logged on to the MDR. The MDRs will be powered on and fully operational. Depending on the control parameter under test, the MDR may be in either VDL Mode 3 or DSB-AM mode. After each control command, the proper response of the MDR to the control command will be verified via the MDT.

a. Transmitter: Configure the 15 watt transmitter for operation and command the transmitter to begin operating DSB-AM mode. Proceed with demonstration to verify local control and monitoring via the MDT (576):

(1) Set MDR in an Offline mode (157). Command a download of MDR operating software set from the MDTS. Show the software storage (2944-35) and the digital signature authentication results (2944-37). Download of control parameter value and file storage (2944-24, 2944-28). Examine the display of all mode control parameters as listed (2944-10). Examine the capability to store at least 4 operating software sets (2944-34) for upload/download processes.

(2) From MDT, demonstrate storage capabilities for at least 15 parameter sets using an operator selectable label (2944-22).

(3) Proceed to adjust all transmitter mode applicable control parameter settings (581) to within associated monitoring parameter tolerances (452, 454 through 482, 532, 584, 694), (2944-23) as summarized in FAA-E-2938, Table 3-3 (163). Procedural steps will demonstrate the MDRs acceptance of control parameter input from the MDT, its ability to reply, monitor and indicate alert/alarm(s) via the MDT connector (158). At the MDT the operator will change control parameter values (2944-16), update the display (2944-17) of the control parameter value, and display any error message(s) generated (2944-18) with respect to control parameter change for verification of the MDTS software.

(4) Once complete, the operator will upload the control parameter value set (2944-25) and seek value set verification (2944-26) and software set verification upon double-verified operator command (2944-36).

(5) Set MDR in an Online mode (157) and examine available control parameters (582).

(6) Restore all control parameters to default values upon receipt of return-to-default command, transition to power up state, initiate sequence and transition to Offline state (if sequence was successful). Verify the MDR is in an Offline state (157). Examine all mode applicable default values, and their associated ranges and operating parameters (452, 454 through 482, 532, 584, 694).

(7) Proceed to re-load the existing software version onto the platform, and introduce an error(s) to “abort” its successful upload. Verify the transfer of a control reply message should a software upload be rejected (571). Verify MDR retention of the previous loaded software edition (24). Examine all mode applicable default values and their associated ranges and operating parameters (452, 454 through 482, 532, 584, 694).

***Note: Loading of a different software version is not allowed. Software upgrades during the OCT are not allowed for any Test, Demonstration, and Inspection verification process*.**

Change the 15 watt transmitter configuration from DSB-AM to VDL Mode 3. Proceed with demonstration to verify all VDL Mode 3 applicable control parameters via the MDT (576) as noted in steps (1) through (6) above.

b. Receiver: Configure the receiver for operation in the DSB-AM mode. Proceed with demonstration to verify local control and monitoring via the MDT (576):

(1) Set the MDR in an Offline mode (157). Command a download of the MDR operating software set from the MDTS. Show the software storage (2944-35) and the digital signature authentication results (2944-37). Download of control parameter value and file storage (2944-24, 2944-28). Examine the display of all receiver mode control parameters as listed in FAA-E-2938 (454 through 482, 532, 584, 694, and 2944-10). Examine the capability to store at least 4 operating software sets (2944-34) for upload/download processes.

(2) From the MDT, demonstrate storage capabilities for at least 15 parameter sets using an operator selectable label (2944-22).

(3) Proceed to adjust all mode applicable control parameter settings (581) to within associated monitoring parameter tolerances (452, 454 through 482, 532, 584, 694, and 2944-23) as summarized in Table 3-3 (163). Procedural steps will demonstrate the MDR's acceptance of control parameter input from the MDT, its ability to reply, monitor and indicate alert/alarm(s) via the MDT connector (158). At the MDT the operator will change control parameter values (2944-16), update the display (2944-17) of the control parameter value, and display any error message(s) generated (2944-18) with respect to control parameter change for verification of the MDTS software.

(4) Once complete, the operator will upload the control parameter value set (2944-25) and seek value set verification (2944-26) and software set verification upon double-verified operator command (2944-36).

(5) Set the MDR in an Online mode (157) and examine available control parameters (582).

(6) Restore all control parameters to default values upon receipt of return-to-default command, transition to power up state, initiate sequence and transition to Offline state (if sequence was successful). Verify the MDR is in an Offline state (157). Examine all mode applicable default values and their associated ranges and operating parameters (452, 454 through 482, 532, 584, 694).

(7) Proceed to re-load the existing software version onto the platform, and introduce an error(s) to "abort" its successful upload. Verify the transfer of a control reply message should a software upload be rejected (571). Verify MDR retention of the previous loaded software edition (24). Examine all mode applicable default values (570), and their associated ranges and operating parameters (452, 454 through 482, 532, 584, 694).

Note: Loading of a different software version is not allowed. Software upgrades during the OCT are not allowed for any Test, Demonstration, and Inspection verification process.

(8) Using an Offeror specified and supplied audio test tool, demonstrate mute and squelch signal capability. From the MDT, invoke audio level control and mute activation/deactivation (52-53). From the MDT ensure the mute signal is at the default level (56). Take and record measurement using audio test tool. From MDT select the other mute attenuation levels (54). Again take and record measurement for verification that it is within +/- 3 dB (55) of the set levels in dB (0 no mute, 15, 20, and no audio). Review the providing of a confirmation signal via the Receiver remote connector for the duration of the mute (696). Demonstrate the receiver mutes audio when either the control parameter of the input from the Receiver remote connector indicate audio muting and unmutes when both indicate unmute (670).

(9) Examine front panel local audio when MDR receiver is generating analog audio (673).

(10) Demonstrate the ability to conduct 0.5 dB step size adjustment between –25 dBm and +20 dBm for audio output level of MDR receiver (48). *Note: Using an RF input of –87dBm carrier, AM modulated 30%, 1004 Hz tone.*

(11) Provide an audio tone at the output of receiver. Ensure squelch is enabled. Display the squelch RF threshold level setting. Display the audio signal-to-noise level setting (583) control parameter. Demonstrate the squelch control adjustment for control of squelch sensitivity (67).

Repeat steps (1) through (6) for a VDL Mode 3 receiver. Proceed with demonstration to verify all VDL Mode 3 applicable control parameters via the MDT (576) as noted in steps (1) through (6).

At conclusion of all transmitter and receiver demonstrations, retain the executed data files via floppy disk (2944-27).

4. <u>DMCP Data Analysis Methods</u>: The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror’s assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET.

1. DMDR Objectives: The objective of the DMDR test case is to verify that the MDR meets the data storage and retrieval requirements via the MDT. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	595 through 596	D	FAA-E-2938	699	D
FAA-E-2938	598 through 612	D	FAA-E-2944	47 through 49	D
FAA-E-2938	659	D			

2. DMDR Test Criteria: The MDR will successfully pass the DMDR test case if the Offeror can demonstrate that they have provided:

a. Log (595) of state change events, log-in/log-out events, control events, failure events, and alarm/alert/return-to-normal events.

b. Automatic state transition (596) with FROM, TO, and DATE/TIME of transition indication(s).

c. Manual state transition log (598) with user terminal field (599) containing the MDT identification or the remote-user terminal identification.

d. Log-in/log-out entry fields (600), a session action field (601) and authentication result field (602).

e. Control event field (603), a MDR response field (604) containing error codes (605) in response field should the MDR reject the control command.

f. A failure event log entry (606) with field (607) containing text or numeric codes to indicate failure type.

g. Alarm/alert/return-to-normal log entry (608) with coded event type field (609).

h. Log of at least 1000 events (610), in any combination, on a first in/first out basis.

i. Log entry retention (611) while MDR is in any state and retained (612) until over-written by a valid log entry.

j. Event log read back (659) reply with event log entries matching filter/data criteria.

k. Event type field containing a coded indication of the event type (699).

The MDTS will successfully pass the DMDR test case if the Offeror can demonstrate that they have provided:

l. Capability to store at least 50 MDR event logs (2944-47) with operator selectable log labels.

m. Operator commanded download (2944-48) of the MDR event log and storage using operator selected file name or label.

n. The ability to view (2944-49) the MDR event log.

3. DMDR Test Approach:

The DMDR test case will be executed through an Offeror-conducted demonstration of data storage and retrieval functions utilizing the Offeror's NEXCOM subsystem. One receiver and one 15 watt transmitter will be required for the demonstration.

> *Note: It is recommended that this test case be demonstrated after Offeror conduct of the following test cases: DMAP, DMCP, DMDS, and DMMR (as a minimum), to establish a database for review.*

Data review will proceed through use of the MDT and MDTS. Data displays, features (595), and event type field(s) (699) will be demonstrated and explained to the OCT Test Team. Data for review, will include, but be not limited to log-in/log-out fields (600, 601, 602), state transition fields (596, 598), user terminal field (599) ID's, control event fields (603, 604, 605), failure entry logs (606, 607), alarm/alert/return-to-normal events (608, 609), log entry retention (611) and retaining (612).

Data file storage of at least 50 MDR event logs on the MDT hard drive will be examined (2944-47). Each event log will be examined to assess its ability to record/retain and display at least 100 log entries (610). Operator commanded downloads of the files will be requested (2944-48). Logs will be evaluated upon their ability for utilization (2944-49), their entries based on matching filter/data criteria via log read back (659) replies.

4. DMDR Data Analysis Methods: The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror's assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET.

1. DMDS Objectives: The objective of the DMDS test case is to verify that the MDR meets the MDT data security requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	160	D	FAA-E-2938	527	D
FAA-E-2938	517	D	FAA-E-2938	660	D
FAA-E-2938	518	D	FAA-E-2938	661	D
FAA-E-2938	519*	D	FAA-E-2938	669*	D
FAA-E-2938	520	D	FAA-E-2944	2	D
FAA-E-2938	521*	D	FAA-E-2944	6 through 9	D
FAA-E-2938	522 and 523	D			

**Note: RIU portion of this requirement is not to be demonstrated in this test case.*

2. DMDS Test Criteria: The MDR will successfully pass the DMDS test case if the Offeror can demonstrate that they have provided:

a. The ability for the radio to continue to operate while the MDT is connected, logged in, and after the removal of the MDT (160).

b. Storage for at least 10 public key certificates (517) in non-volatile memory and maintained through power loss and restoral (518).

c. Add/delete mechanisms for public key via MDT (519).

d. Acceptance of all control parameter commands except ID#30, upon a request from a valid digitally signed authorization token (520).

e. Security token authorization each time a MDT logs in (521).

f. Rejection of software uploads that are not digitally signed or contain an invalid digital signature (522).

g. Rejection of all control parameters, except ID#30, associated with a failure in the digital signature verification process (523).

h. Termination of the control session upon log-out, MDT disconnection or no receipt of control parameters within 30 minutes (527).

i. Security-token validation (660) using non-null public keys (key ID of 0 to 4).

j. Binary image and digital signature validation (661) performed using non-null public keys (ID 5 to 9).

k. Control sessions (for MDR) initiated upon successful authentication MDT log on security token (669).

The MDTS will successfully pass the DMDS test case if the Offeror can demonstrate that they have provided:

l. Functionality to identify and authenticate an operator(s) via a User ID and password (2944-2) before operator access. Note: User ID field: 20 character maximum, password field: 8 character/numeric maximum.

m. Issuance of log-in/log-out control parameter (ID#1) upon MDR connection and log-in/log-out detection (2944-6).

n. Terminal ID field transfer during log-in/log-out (2944-7).

o. Automatic attempt to log into a "reset" MDR to re-establish a control session after the user has commanded a MDR reset (2944-8).

p. Log-out upon operator command (2944-9).

3. <u>DMDS Test Approach</u>: The DMDS test case will be executed through a Offeror conducted demonstration of MDT data security functions utilizing the Offeror's NEXCOM subsystem. One receiver and one 15 watt transmitter will be required with the demonstrations performed in DSB-AM mode.

Receiver Set-up:

- The Offeror will demonstrate successful log-in/security token authorization (521) to the MDR using the MDT/MDTS and access to all control parameters (520). The log-in will demonstrate implementation of security-token validation (660) and binary image and digital signature validation (661) using non-null public keys, user ID and password identification and authentication processes (2944-2).
- Log-in issuance and detection (2944-6) coupled by terminal ID field transfer will be examined (2944-7). Successful authentication of the security token, MDR control sessions will initiate (669).
- A test instrument (specified by the Offeror to show MDR operation) will be connected to the transmitter or receiver under demonstration. MDR performance will be evaluated via the test instrument and MDT screen (and MDR front panel if appropriate). The MDT will be removed from the MDR (160). The test instrument must show no impact of MDR operation due to MDT disconnection.
- Next, the addition of public keys (519) will be demonstrated, followed by a deletion process of one public key. The added public key(s) should log into the MDR to conduct a control session.
- An invalid software upload (not digitally signed or containing an invalid signature) will be demonstrated to verify its rejection (522).
- A power "loss" event will be conducted on the MDR. The operator will again log-in to the MDR to demonstrate successful storage of public key certificates in non-volatile memory (517, 518) and commence with a control session. The log-on process will revalidate security

token authentication, digital signatures, etc., shown earlier (520, 521, 660, 661, 669, 2944-2, 2944-6, 2944-7).

- Under the control session, the operator will invoke a MDR reset command. An automatic attempt to log into the "reset" MDR should occur within the prescribed time frame (2944-8). Once successful, the operator will log-out of the MDR (2944-9, 527).
- The operator will attempt a log-in to the MDR using unauthorized passwords and ID's. The equipment (MDR, MDTS) will be evaluated upon its inherent denial of service capability to a non-valid IDs and non-valid log-on passwords (520, 521, 660, 661, 669, 2944-2, 2944-6, 2944-7). Verify that the failure within the digital signature verification process rejected access (523) to all control parameters associated with a failure except ID#30.
- Again, the operator will successfully log-in to the MDR using a valid ID and password and proceed with a control session for a specified time. Afterwards, MDT interrogation will cease (remain "idle") to signal the start of the pre-determined period (30 minutes) of operator inactivity. After the period has expired the control session will terminate (527) and the status of primary control of the MDR will be documented.

Transmitter Set-up:

The process described for the receiver set-up will be repeated for the 15 watt Transmitter under DSB-AM mode.

4. <u>DMDS Data Analysis Methods</u>: The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror's assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET.

1. DMDT Objectives: The objective of the DMDT test case is to verify by use that the MDTS meets the minimum MDT Platform requirement. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2944	1	D			

2. DMDT Test Criteria: The MDTS can be installed and operated on a FAA MDT that is configured with at least the following:

a. Windows 95, 98, 2000 or NT

b. 100 Mb, or greater, of Hard Drive space for MDTS use

c. 32 MB of RAM or greater

d. 800x600x8 display or better

e. Pentium 200 processor or higher

f. RS-232 serial interface using DB-9 connector.

g. Single standard high density floppy drive.

3. DMDT Test Approach: The FAA will provide a MDT that is within the requirements listed above. This MDT will be provided to each Offeror who will be requested to install their MDTS software via the floppy drive. The Offeror will then demonstrate proper MDTS operation by using the FAA MDT to run the following test case demonstrations:

- DMAP, Alarm/Alert Processing
- DMCP, Control Parameters
- DMDR, Data Storage/Retrieval
- DMDS, Data Security
- DMMR, Monitoring and Reporting Parameters

4. DMDT Data Analysis Methods: Not applicable.

1. DMMR Objectives: The objective of the DMMR test case is to verify that the MDR meets monitoring and reporting requirements via the MDT. In general, the acquisition of monitoring parameters, data collection, and comparison to stored system parameters will be examined. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	158*	D	FAA-E-2938	505 - 511*****	D
FAA-E-2938	169	D	FAA-E-2938	590 - 594*****	D
FAA-E-2938	171**	D	FAA-E-2938	597*****	D
FAA-E-2938	172**	D	FAA-E-2938	662 - 665*****	D
FAA-E-2938	173	D	FAA-E-2938	668*****	D
FAA-E-2938	195	D	FAA-E-2938	576*	D
FAA-E-2938	485*****	D	FAA-E-2938	585	D
FAA-E-2938	486 – 488****	D	FAA-E-2938	681 – 683	D
FAA-E-2938	489 – 494*****	D	FAA-E-2938	695***	D
FAA-E-2938	495***	D	FAA-E-2944	10*	D
FAA-E-2938	497 – 503*****	D	FAA-E-2944	11 through 15	D
FAA-E-2938	504******	D	FAA-E-2944	38 through 44	D

**Also see Test Case DMCP/DMMR.*

***RIU portion of this requirement will not be demonstrated by this test case.*

****Also verified by DMPO/IMMP*

*****Also verified by DSTU/IMMP*

******Also verified by IMMP*

*******Also verified by DMTT/IMMP*

2. DMMR Test Criteria: The MDR will successfully pass the DMMR test case if the Offeror can demonstrate that they have provided:

a. Monitors output data via the MDT connector (158).

b. Real-time system performance monitoring and real-time system performance reporting in the Online and Offline states (169).

c. Forwarding of monitoring messages to the MDT upon request, when alert and alarm thresholds are crossed, and upon a return-to-normal operating range event (171).

d. Forwarding of alert and alarm status messages within 4 seconds to the MDT when monitored parameters are crossed (172).

e. The MDR system monitoring function does not block or delay operational communications and management, and does not require the need to insert an external command (173).

f. Monitor specified parameters defined in FAA-E-2938, Table 3-4 (195), their respective ranges, resolutions, tolerances and default values (485-495, 497-511, 590-594, 597, 662-665, 668, 695).

g. Local control and monitoring by interface and interoperation with the MDT (576).

h. Provide data on supportable (within threshold range) monitoring and reporting functions when in the RECOVERY state (585).

i. A permanent, non-changeable and unique identification (ID) number which is both marked on the front panel and accessible via the monitoring parameter (681), with numbers assigned such that the transmitter ID are ODD numbered and the receiver are EVEN numbered (682), as specified in FAA-E-2938, Section 3.2.3.5.30 (683).

The MDTS will successfully pass the DMMR test case if the Offeror can demonstrate that they have provided:

j. Display of operator selected monitored and control parameters as listed in FAA-E-2938 Table 3-3 and Table 3-4 (2944-10).

k. Operator selectable numeric or graphic display (2944-11).

l. Select/display of 3 parameters simultaneously (2944-12).

m. Selection of one-shot read or continuous read (near real-time) (2944-13).

n. In continuous read mode, the read back rate can change (2944-14) based on MDT issue of control parameter ID#30. Rate change from 1 per second (approx.) to 1 per 240 milliseconds.

o. Display update of continuous read back sample (2944-15).

p. The capability to record operator selected continuous read time records for later review and analysis (2944-38).

q. The data recording can be discontinued anytime after initiation (2944-39).

r. Selectable recording rate (2944-40) from 1 sample/minute (approx.) to 1 sample/240 milliseconds.

s. Storage of up to 15,000 samples per recorded parameter (2944-41).

t. Recording of at least 2 parameters simultaneously while displaying at least 2 parameters (2944-42).

u. The recording includes parameter ID, value, and time stamp (2944-43).

v. Control parameters can be set while selected monitoring parameters are recorded (2944-44).

3. <u>DMMR Test Approach</u>:

The DMMR test case will be executed through an Offeror conducted demonstration of monitoring and reporting functions. One receiver and one 15 watt transmitter will be required for the demonstration.

a. Configure the 15 watt transmitter for operation and command the transmitter to begin operating DSB-AM mode.

(1) Connect the MDT to the MDR (158, 576) to review the monitoring data function(s). Using the MDT, review the MDTS features providing data recording fields of parameter value, ID, and time stamps (2944-43), storage samples per parameter (2944-41). Review features to select data recording rate (2944-40) and the ability to discontinue a data recording session (2944-39). Review whether a permanent, non-changeable and unique identification (ID) number which is both marked on the front panel and accessible via the monitoring parameter (681), with numbers assigned such that the transmitter ID are ODD numbered and the receiver are EVEN numbered (682), as specified in FAA-E-2938, Section 3.2.3.5.30 (683) was provided for the "SUBMISSION for OCT".

(2) Instruct the MDR to the **Online state**. Using the MDT, monitor all applicable functions (195, 485-495, 497-511, 590-594, 597, 662-665, 668, 695). Invoke "failures" into the radio via control parameters, external stimuli, etc. to cause the forwarding of monitoring messages when alarm, alert, and return-to-normal parameter thresholds are exceeded (171). Review the associated alarm and alert status messages (172).

(3) Using the MDT, verify the MDTS software has displayed selected parameters (2944-10). Verify each display has either a graphic or numeric display (2944-11). Verify simultaneous display of at least 3 parameters is achieved (2944-12). The operator will invoke one-shot reads and continuous reads for selected parameters (2944-13, 2944-14, 2944-15) and display the implemented data recording features for subsequent review and analysis (2944-38). Demonstrate the MDTS ability to simultaneously record and display parameters (2944-42).

(4) While remaining in the Online state, the operator will modify a set of control parameters (175, 2944-44). Review the effects of this action on the MDR's ability to continue its parameter monitoring process (175) and its compliance with operating requirements.

(5) Instruct the MDR to the **Offline state**. Using the MDT, monitor all applicable functions (195, 485-495, 497-511, 590-594, 597, 662-665, 668, 695). Invoke "failures" into the radio via control parameters, external stimuli, etc. to cause the forwarding of monitoring messages when alarm, alert, and return-to-normal parameter thresholds are exceeded (171). Review the associated alarm and alert status messages (172).

(6) Using the MDT, verify the MDTS software has displayed selected parameters (2944-10). Verify each display has either a graphic or numeric display (2944-11).

Verify simultaneous display of at least 3 parameters is achieved (2944-12). The operator will invoke one-shot reads and continuous reads for selected parameters (2944-13, 2944-14, 2944-15) and display the implemented data recording features for subsequent review and analysis (2944-38). Demonstrate the MDTS ability to simultaneously record and display parameters (2944-42).

(7) While remaining in the Offline state, the operator will modify a set of control parameters (175, 2944-44). Review the effects of this action on the MDR's ability to continue its parameter monitoring process (175) and its compliance with operating requirements.

(8) Initiate a **Recovery state**. Using the MDT, monitor all applicable functions (195, 485-495, 497-511, 590-594, 597, 662-665, 668, 695) available in the recovery state (585). Invoke "failures" into the radio via control parameters, external stimuli, etc. to cause the forwarding of **all available** monitoring messages when alarm, alert, and return-to-normal parameter thresholds are exceeded (171). Review the associated alarm and alert status messages (172).

Change the 15 watt transmitter configuration from DSB-AM to VDL Mode 3. Repeat steps (1) through (8) on the VDL Mode 3 transmitter.

Configure the MDR receiver for operation and command the receiver to begin operating DSB-AM mode. Repeat steps (1) through (8) on the DSB-AM receiver.

Change the MDR receiver configuration from DSB-AM to VDL Mode 3. Repeat steps (1) through (8) on the VDL Mode 3 receiver.

Successful conduct of the demonstration should ensure all sensors, devices and algorithms required to provide parameter, state, and failure monitoring has been implemented and the monitoring functions do not block or delay MDR operations nor require an external intervention (173).

4. <u>DMMR Data Analysis Methods</u>: The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror's assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET.

1. DMPO Objectives: The objective of the DMPO test case is to verify that the Offeror has provided RF power output range and step sizes for DSB-AM in the 15 watt and 50 watt transmitter. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	95	D	FAA-E-2938	464*	D
FAA-E-2938	125	D	FAA-E-2938	495**	D
FAA-E-2938	129	D	FAA-E-2938	691	D

**Only partially verified by this test case. Also see test case DMCP.*

***Only partially verified by this test case. Also see test case DMMR.*

2. DMPO Test Criteria: The MDR will successfully pass the DMPO test case if the Offeror can demonstrate that they have provided transmitter the RF power output in a 0.5 dB step size for DSB-AM for the 15 watt and 50 watt transmitter. Specifically, the transmitters will contain:

a. There are two configurations of transmitters: 1) one configuration with an output power level adjustable from 2 watts to 15 watts, and 2) a configuration with an output power level adjustable from 10 watts to 50 watts. (95)

b. Be adjustable in 0.5 dB steps over a range of 2 to 15 watts (125).

c. Be adjustable in nominal 0.5 dB steps over a range of 10 to 50 watts, unmodulated CW RF power (129).

d. RF output power adjustable in nominal 0.5 dB steps over a range of 2 to 50 watts, unmodulated CW RF power (691).

e. Control parameter, output power (ID#12), as specified (464).

f. Monitor parameter, output power (ID#12), as specified (495)

3. DMPO Test Approach:

DMPO will consist of an Offeror demonstration to evaluate design compliance to the RF power output range and step size requirements. Real-time control and monitoring parameters (464, 495) capabilities will be demonstrated the DSB-AM transmitter configuration in support of RF test instrument data acquisition. DMPO will be conducted upon a 15 watt transmitter and a 50 watt transmitter.
Note: The Offeror will be required to set-up a test configuration for RF output power verification.

- 15 watt: From the MDT (464), adjust the transmitter in 0.5 dB steps between 2 and 15 Watt (125). Using the RF test instrument (signal analyzer), record the actual operating setting. Compare this recorded value to the value provided on the MDT monitoring data fields (495). Record monitoring data point.

- 50 watt: From the MDT (464), adjust the transmitter in 0.5 dB nominal steps between 10 and 50 Watts (129). Using the RF test instrument (signal analyzer), record the actual operating setting. Compare this recorded value to the value provided on the MDT monitoring data fields (495). Record monitoring data point.

- 2-50 Watt Single Enclosure (if implemented): From the MDT (464), adjust the transmitter in nominal 0.5 dB steps between 2 and 50 watts (691) for a single enclosure unit. Using the RF test instrument (signal analyzer), record the actual operating setting. Compare this recorded value to the value provided on the MDT monitoring data fields (495). Record monitoring data point.

4. <u>DMPO Data Analysis Methods</u>:

The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror’s assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET.

1. DMTT Objectives: The objective of the DMTT test case is to verify that the Offeror has provided a transmitter timeout function. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	106	D	FAA-E-2938	649	D
FAA-E-2938	107	D	FAA-E-2938	472*	D
FAA-E-2938	108	D	FAA-E-2938	504**	D

**Only partially verified by this test case. Also see test case DMCP.*

***Only partially verified by this test case. Also see test case DMMR.*

2. DMTT Test Criteria: The MDR will successfully pass the DMTT test case if the Offeror can demonstrate that they have provided a transmitter timeout function to:

a. Protect against and eliminate extended periods of inadvertent continuous key (106).

b. An adjustable time-out range from 5 seconds to 5 minutes, in 5 second increments (107).

c. Provide the ability to disable time-out function for instances where a continuous key is desirable (108).

d. Upon time-out, the MDR will cease radiating until the initial PTT key is deactivated and re-asserted (649).

e. Adherence to the specified control and monitoring parameters (472, 504).

3. DMTT Test Approach:

DMTT will consist of an Offeror demonstration of the design of the transmitter time-out function. Real-time control and monitoring parameters (472, 504) capabilities will be demonstrated for invoking and configuring the transmitter time-out function. DMTT will be conducted upon a 15 watt transmitter configured in DSB-AM mode.

Transmitter Time-out enabled:

- Using the MDT, verify default settings for the transmitter time-out function (472, 504). Verify the transmitter timeout function is **enabled**. Key the transmitter via a PTT (invoked via the MDT or Transmitter Remote Interface) and verify PTT key activity at RF output using RF signal analyzer. View the MDT display to confirm PTT key activity. Confirm PTT key activity using a voltmeter/digital multimeter should PTT key be applied via the transmitter remote interface.

- Continue to apply PTT key until transmitter time-out is invoked (106). Review loss of RF signal via RF signal analyzer (649). View MDT display to confirm PTT key activity. Confirm PTT key activity using a voltmeter/digital multimeter should PTT key be applied via the transmitter remote interface. Deactivate PTT key (reset process) (649).
- Using MDT display (107), invoke the maximum set timeout (5 minutes). Key the transmitter via a PTT and again verify PTT key activity. Continue to apply the PTT key until transmitter time-out is invoked (106). Review loss of RF signal via RF signal analyzer (649). View MDT display to confirm PTT key activity. Confirm PTT key activity using a voltmeter/digital multimeter should PTT key be applied via the transmitter remote interface.

Transmitter Time-out disabled (108):

- Using the MDT, verify default settings for the transmitter time-out function (472, 504). Verify the transmitter timeout function is **disabled**. Key the transmitter via a PTT and verify PTT key activity at RF output using RF signal analyzer. View the MDT display to confirm PTT key activity. Apply PTT key signal for 15 minutes. Deactivate the PTT key once 15 minutes has passed.

4. <u>DMTT Data Analysis Methods</u>:

The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror’s assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET.

1. DRSL Objectives: The objective of the DRSL test case is to verify that the receiver meets the selectivity requirement across the specified frequency band. The following requirement will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	38*	D			

**25 kHz Profile will only be demonstrated in DSB-AM.*

2. DRSL Test Criteria: The MDR will successfully pass the DRSL test case if the Offeror can demonstrate that they have provided the selectivity profile across the entire specified frequency band.

Selectivity Profile

Level	**DSB-AM Bandwidth (25 kHz Ch.)**	**DSB-AM Bandwidth (8.33 kHz Ch.)**
- 6.0 dB	± 9 kHz Maximum	± 3.5 kHz Maximum
- 60.0 dB	± 25 kHz Maximum	± 8.33 kHz Maximum
- 80.0 dB	± 50 kHz Maximum	± 25 kHz Maximum

3. DRSL Test Approach:

DRSL will consist of an Offeror demonstration of the receiver's selectivity. DRSL will be conducted upon a receiver configured in DSB-AM mode (25kHz and 8 1/3 kHz). The Offeror will demonstrate the selectivity with respect to the tuned channel center frequency across the entire frequency band.

> *Note: The Offeror will define and supply the demonstration tools utilized in this demonstration and, as a minimum, tune the receiver to three frequencies within the band (low, mid, high) for both 25kHz and 8 1/3 kHz.*

4. DRSL Data Analysis Methods:

The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror's assistance, will analyze all data collected and determine whether the requirement was successfully demonstrated. Compliance to the requirement will be recorded through the RCR coordinated with the NEXCOM MDR TET.

1. DSFQ Objectives: The objective of the DSFQ test case is to verify that the Offeror has provided the FAA with the ability to retune a receiver or transmitter within the prescribed time period. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	297*	D	FAA-E-2938	298	D

**Demonstrated in DS-AM mode only.*

2. DSFQ Test Criteria: The MDR will successfully pass the DSFQ test case if the Offeror can demonstrate that they have provided the FAA with:

a. Frequency retuning of a receiver or transmitter along with any realignment within 30 minutes. This time includes the retune of internal filters (297).

b. Protective features to guard against inadvertent frequency changes (298).

3. DSFQ Test Approach:

DSFQ will consist of an Offeror demonstration that shows how transmitter and receiver frequency retune process was designed. DSFQ will be conducted upon a 15 watt transmitter configured in DSB-AM mode. Likewise, the DSFQ will be conducted upon a receiver configured in DSB-AM mode.

The Offeror will retune the MDR to a new operating frequency using the MDR front panel, the MDT, or a combination of both. A RF instrument (specified by the Offeror to show MDR operation) will be connected to the transmitter or receiver under demonstration. The change in MDR operating frequency will be evaluated via an RF test instrument, the MDT monitor (if appropriate) and the MDR front panel instrumentation (if appropriate).

The Offeror will invoke an erroneous command set(s) to demonstrate the protective features used to guard against in advertent frequency changes.

4. DSFQ Data Analysis Methods:

The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror’s assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET

1. DSST Objectives: The objective of the DSST test case is to verify that the MDR meets the state and state transition requirements. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	533	D	FAA-E-2938	550	D
FAA-E-2938	534	D	FAA-E-2938	553	D
FAA-E-2938	536 through 538	D	FAA-E-2938	554**	D
FAA-E-2938	539*	D	FAA-E-2938	555 through 567	D
FAA-E-2938	540 through 547	D			

**DC operation will not be demonstrated.*

***RIU interface operation will not be demonstrated.*

2. DSST Test Criteria:

The MDR will successfully pass the DSST test case if the Offeror can demonstrate that they have provided:

a. States: OFF, Power Up, Offline, Online, Recovery, Failed, and Power Down (if exercised) (533) with front panel visual indication of states (534) when AC power is present at the MDR power input (539).

b. State transitions in accordance with FAA-E-2938, Section 6, Table 6-1 and Figure 6-2 (536)

c. A transmitter that does not transmit while in the OFF state (537), in the power up state (540), when in the recovery state (555), and when in the failed state (559).

d. A receiver that does not generate any form of audio while in the OFF state (538), in the power up state (541), when in the recovery state (556), and when in the failed state (560).

e. A maximum of 30 seconds between application/restoral of MDR power and the MDR's transition from the power up state (542).

f. Conduct and complete Power On Self test functions in the power up state (543).

g. When in an Offline state: remote analog audio and remote discrete push-to-talk (PTT) are disabled (546) and the digital, local analog audio and local PTT inputs are enabled (547).

h. If the MDR employs a power down state, when in a power down state, the transmitter will not transmit (563), the receiver will not generate any form of audio output (564), all functions are disabled except logging/reporting and front panel indication (565), front panel visual indication that MDR is ready to transition to the Off state (566).

i. Acceptance of control parameter to transition to the Power Down state (ID#5 "MDR

State” with value “Power Down”) only from the MDT port (567) should the Power Down State be implemented.

j. MDR enables only those control commands accurately executable while in the failed state (561).

k. Failed state transitioning upon detection of unrecoverable failure (562).

l. MDR enters the recovery state upon detection of a potentially recoverable failure (553), which include, but are not limited to, over-temperature conditions (554).

m. If recovery processes were successful, the MDR reverts to the previous state thus exiting the recovery state (557), or, transitions to the Failed state upon unsuccessful recovery processes (558).

n. When in the Online state the MDR enables (550) all functions, processes control parameter commands in accordance with FAA-E-2938, Section 3.2.3.2 and disables the local user analog input and local user PTT when the remote user PTT (or audio equivalent) is active.

o. Upon completion of Power Up sequence the MDR transitions from Power Up state to Online state (should Online have been the previous state) or to the Offline state (should Offline have been the previous state) (544, 545).

3. <u>DSST Test Approach</u>:

DSST will consist of an Offeror demonstration of the receiver and transmitter state design. DSST will be conducted upon a 15 watt transmitter configured in DSB-AM mode and a receiver configured in DSB-AM mode. State transitioning in VDL Mode 3 will not be examined.

Note: Before the demonstration the Offeror will define the states implemented in the OCT submittals (533).

Receiver Set-up:

- **State Transition**: Conduct a demonstration to show compliance to the state transitions (533, 536) as specified in FAA-E-2938, Table 6-1 and Figure 6-2. For each transition, highlight the visual indication (534, 539) implemented on the MDR front panel. The demonstration will include stimuli to verify the following requirements: 542, 544-545, 553-554, 557-558, 562.

- **OFF State**: Configure the MDR receiver for OFF state performance (533), check front panel state status (534). Provide the receiver a RF signal with signal strength able to break squelch. Using an audio test tool connected to the receiver’s audio output port, verify no audio is present. Remove the RF signal from the receiver under test. Again, verify no form of “audio” is present at receiver’s audio output port (538).

- **Power Up State**: Configure the MDR receiver for Power Up state performance (533), check front panel state status (534). Provide the receiver a RF signal with signal strength able to break squelch. Using an audio test tool connected to the receiver's audio output port, verify no audio is present. Remove the RF signal from the receiver under test. Again, verify no form of "audio" is present at receiver's audio output port (541). Instruct the receiver to conduct and complete a power-on self test (543) and report the results.

- **Offline State**: Configure the MDR receiver for Offline state performance (533), check front panel state status (534). Verify the remote analog audio is disabled (546).

- **Online State**: Configure the MDR receiver for Online state performance (533), check front panel state status (534). Verify all applicable functions are enabled (550).

- **Recovery State**: Configure the MDR receiver for Recovery state performance (533), check front panel state status (534). Provide the receiver a RF signal with signal strength able to break squelch. Using an audio test tool connected to the receiver's audio output port, verify no audio is present. Remove the RF signal from the receiver under test. Again, verify no form of "audio" is present at receiver's audio output port (556).

- **Failed State**: Configure the MDR receiver for Failed state performance (533), check front panel state status (534). Provide the receiver a RF signal with signal strength able to break squelch. Using an audio test tool connected to the receiver's audio output port, verify no audio is present. Remove the RF signal from the receiver under test. Again, verify no form of "audio" is present at receiver's audio output port (560). Using Control and Monitoring features of the MDT and MDTS, verify that only those commands that can be executed accurately are available in the Failed State (561).

- **Power Down State** (if implemented): Configure the MDR receiver for Power Down state performance (533), check front panel state status (534). Provide the receiver a RF signal with signal strength able to break squelch. Using an audio test tool connected to the receiver's audio output port, verify no audio is present. Remove the RF signal from the receiver under test. Again, verify no form of "audio" is present at receiver's audio output port (564). Using Control and Monitoring features of the MDT and MDTS, verify all functions are disabled (565), except logging/reporting and front panel indication (534). Review front panel for visual indication (566) that MDR is ready for OFF State transition. Demonstrate Power-Down state transitioning is invoked only from the MDT port (567).

Transmitter Set-up:

- **State Transition**: Conduct a demonstration to show compliance to the state transitions (533, 536) as specified in FAA-E-2938, Table 6-1 and Figure 6-2. For each transition, highlight the visual indication (534, 539) implemented on the MDR front panel. The demonstration will include stimuli to verify the following requirements: 542, 544-545, 553-554, 557-558, 562.

- **OFF State**: Configure MDR transmitter for OFF state performance (533), check front panel state status (534). Connect a RF signal analyzer to the output of the transmitter. Key the transmitter (via MDT control or front panel activation) and using the RF signal analyzer verify the transmitter is not transmitting RF energy (537). Remove the PTT key and again verify the transmitter is not transmitting RF energy using the RF signal analyzer (537).

- **Power Up State**: Configure the MDR transmitter for Power Up state performance (533), check front panel state status (534). Connect a RF signal analyzer to the output of the transmitter. Key the transmitter (via MDT control or front panel activation) and using the RF signal analyzer verify the transmitter is not transmitting RF energy (540). Remove the PTT key and again verify the transmitter is not transmitting RF energy using the RF signal analyzer (540). Instruct the transmitter to conduct and complete a power-on self test (543) and report the results.

- **Offline State**: Configure the MDR transmitter for Offline state performance (533), check front panel state status (534). Verify the remote analog audio and remote discrete PTT input functions are disabled (546). Verify the digital, local analog audio and local PTT inputs are enabled (547) by "keying" the transmitter, provide an audio source into the transmitter and witness RF waveform on RF signal analyzer attached to output of the transmitter, for example.

- **Online State**: Configure the MDR transmitter for Online state performance (533), check front panel state status (534). Verify all applicable functions are enabled (550). Verify local user analog audio input and local PTT input functions are disabled (550). Demonstrate the ability to activate a remote user PTT (or audio equivalent).

- **Recovery State**: Configure the MDR transmitter for Recovery state performance (533), check front panel state status (534). Connect a RF signal analyzer to the output of the transmitter. Key the transmitter (via MDT control or front panel activation) and using the RF signal analyzer verify the transmitter is not transmitting RF energy (555). Remove the PTT key and again verify the transmitter is not transmitting RF energy using the RF signal analyzer (555).

- **Failed State**: Configure the MDR transmitter for Failed state performance (533), check front panel state status (534). Connect a RF signal analyzer to the output of the transmitter. Key the transmitter (via MDT control or front panel activation) and using the RF signal analyzer verify the transmitter is not transmitting RF energy (559). Remove the PTT key and again verify the transmitter is not transmitting RF energy using the RF signal analyzer (559). Using Control and Monitoring features of the MDT and MDTS, verify that only those commands that can be executed accurately are available in the Failed State (561).

- **Power Down State** (if implemented): Configure the MDR transmitter for Power Down state performance (533), check front panel state status (534). Connect a RF signal analyzer to the output of the transmitter. Key the transmitter (via MDT control or front panel activation) and using the RF signal analyzer verify the transmitter is not transmitting RF energy (563). Remove the PTT key and again verify the transmitter is not transmitting RF energy using the RF signal analyzer (563). Using Control and Monitoring features of the MDT and MDTS, verify all functions are disabled (565), except logging/reporting and front panel indication (534). Review front panel for visual indication (566) that MDR is ready for OFF State transition. Demonstrate Power-Down state transitioning is invoked only from the MDT port (567).

4. <u>DSST Data Analysis Methods</u>: The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror's assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET.

1. DSTU Objectives: The objective of the DSTU test case is to verify that the Offeror has provided the FAA with the specified tuning range and channel increment(s). The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	2	D	FAA-E-2938	18	D
FAA-E-2938	3	D	FAA-E-2938	455 through 457*	D
FAA-E-2938	5 through 8	D	FAA-E-2938	486 through 488**	D

**Only partially verified by this test case. Also see test case DMCP.*

***Only partially verified by this test case. Also see test case DMMR.*

2. DSTU Test Criteria: The MDR will successfully pass the DSTU test case if the Offeror can demonstrate that they have provided the specified tuning range and channel increments. Specifically, the receivers and transmitter will contain:

a. 25 kHz channel separations in the ICAO DSB-AM mode (2).

b. 25 kHz channel separations in the ICAO VDL Mode 3 (3).

c. A 25 kHz channel tuning capability between 112.000 MHz to 136.975 MHz (5).

d. A user selectable lowest tunable frequency between 112.000 MHz and 118.000 MHz in 25 kHz steps (6).

e. A default start frequency of 118.000 MHz upon initialization (7) with all control and monitoring parameters assuming their default values.

f. Capability to tune in 8 1/3 kHz channel increment (8).

g. The ability to reconfigure for operation in known ICAO standardized communication waveforms (i.e., 25 kHz DSB-AM, 8 1/3 kHz DSB-AM, and VDL Mode 3). (18)

h. Adherence to the specified control and monitoring parameters (455, 456, 457, 486, 487, 488).

3. DSTU Test Approach:

DSTU will consist of an Offeror demonstration of the design of the tuning range and channel increments of the transmitter and receiver. Real-time control and monitoring parameters (457, 488) capabilities will be demonstrated on all modes of operation.

DSTU will be conducted upon a 15 watt transmitter configured in DSB-AM mode (25kHz and 8

1/3kHz) and repeated for VDL Mode 3. Likewise, the DSTU will be conducted upon a receiver configured in DSB-AM mode (25kHz and 8 1/3kHz) and repeated for VDL Mode 3.

The MDR unit(s) will be powered-up from an initial unmodified state (i.e. factory settings). The start frequency and default control and monitoring parameters will be recorded. The MDR units will be tuned to frequencies within the range of 118.000 MHz to 136.975 MHz. The MDR will be tuned in 25 kHz steps within the range of 112.000 MHz and 118.000 MHz.

4. DSTU Data Analysis Methods:

The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror's assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET.

1. DSWU Objectives: The objective of the DSWU test case is to verify that the Offeror has provided a radio with the specified warm-up and set up capabilities. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	265	D	FAA-E-2938	266	D

2. DSWU Test Criteria: The MDR will successfully pass the DSWU test case if the Offeror can demonstrate that they have provided:

   a. Receivers and transmitters set up and adjusted under normal operating conditions as followed by procedures in the technical instruction book (265).

   b. Receivers and transmitters that meet full power operation within 30 seconds of turn-on (266).

3. DSWU Test Approach:

DSWU will consist of an Offeror demonstration of how warm-up and set-up requirements were implemented. DSWU will be conducted upon a 15 watt transmitter configured initially in DSB-AM mode and a receiver configured in DSB-AM mode.

MDR set-up, alignment and adjustment(s) will follow the procedures outlined in the Offeror's technical instruction book. Should deviations from the technical instruction book be required, the deviation process will be noted (as earlier delineated through the instructions for demonstration script preparation and implementation).

Electrical power will be interrupted to the MDR under evaluation. Upon the reapplication of power, the normal operation of the MDR will be verified to occur in 30 seconds or less.

4. DSWU Data Analysis Methods:

The Offeror demonstration scripts will contain the text to describe the expected outcome of each demonstration step. During execution of the demonstration, the OCT Test Team and Offeror will record whether the anticipated outcome was demonstrated. After all demonstrations of this test case were conducted, the OCT Test Team, without the Offeror's assistance, will analyze all data collected and determine whether the requirements were successfully demonstrated. Compliance to the requirements will be recorded through the RCR coordinated with the NEXCOM MDR TET.

APPENDIX B7 - INTERFACE TEST CASES

Interface Test Case Descriptions: The 15 watt and 50 watt transmitters and the receiver will be subjected to RIU interface testing. This testing will validate the MDR units' ability to meet NAS-IC-41033502 and FAA-E-2938 requirements. The following pages describe the Interface Test Cases identified in Figure 10.

It is very important that the FAA be able to establish a communications link between the RIU simulator and the MDR. Therefore, the ILLI test will be the first test run on the MDRs in the OCT Testbed.

If an MDR fails this test, the remainder of the Interface Test Cases will not be run. As a result, the MDR will automatically fail the remaining Interface Test Cases. At least three attempts at running and completing the ILLI test will be made before deeming the test a failure. A failure of the ILLI test can be a result of not meeting one or more of the criteria list in the ILLI test case. However, the inability to meet a single criterion may not automatically result in the failure of the entire test case.

Failure to pass the ILLI test and establish a communications link between the RIU simulator and the MDR will significantly reduce the FAA's ability to evaluate the MDR during OCT. The result could be failure of a significant number of Transmitter, Receiver, and System tests.

1. IDBM Objectives: The objective of the DBM test case is to verify the data burst message formats being sent to/from the MDR. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	406*	T	NAS-IC-41033502	178	T
FAA-E-2938	407*	T	NAS-IC-41033502	258*	T
FAA-E-2938	408*	T	NAS-IC-41033502	259*	T
FAA-E-2938	409	T	NAS-IC-41033502	260*	T
FAA-E-2938	628	T	NAS-IC-41033502	263	T
NAS-IC-41033502	172*	T	NAS-IC-41033502	264	T

**Only partially fulfilled by this test case. Completely fulfilled by: IVBM, IDBM, IMBM, ISCM, IPVM, IRCM, IRMM, and ILSM.*

2. IDBM Test Criteria: The receiver and transmitter(s) will successfully pass the IDBM test case if the following conditions are met:

a. The Data-Burst message is encoded as defined in Figure 3-76 and Table 3-9 of NAS-IC-41033502. The transmitters are able to receive the Data-Burst message from the RIU (Message ID=1). The receiver is to be able send the Data-Burst message to the RIU (Message ID=1). (178, 406, 407, 408, 409, and 628)
b. The TOA/TOT field is the same value for all Data-Burst message segments related to the same VDL Mode 3 data burst. (263)
c. The VDL Mode 3 data burst D8PSK symbols are mapped to Data-Burst message DF octets as specified in Table 3-8a of NAS-IC-41033502. (264)
d. Each message exchanged across the data interface contains a one octet Message ID followed by the message. (172)
e. Bit fields are encoded such that the most significant bit of a field (or sub-field that crosses octet boundaries) is in the highest bit number position of the octet. (258)
f. For variable length bit fields that have a total length (LEN) that is not a multiple of 8, the most significant bit of the part-octet (remaining part of the field) at the end of the field are encoded in bit 8 of the last octet and the unused lower numbered bit(s) in the last octet shall be set to 0. (259 and 260)

3. IDBM Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

The following requirements are partially fulfilled by meeting the criteria of the lower level requirements of this test case: FAA-E-2938 Shall #406, 407, and 408 and NAS-IC-41033502 Shall #172, 258, 259, and 260

4. IDBM Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. IDLL Objectives: The objective of the IDLL test case is to verify the MDR can receive/transmit data link level messages as required by NAS-IC-41033502. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	400	T	NAS-IC-41033502	287	T
NAS-IC-41033502	158 – 164	T	NAS-IC-41033502	290 and 291	T
NAS-IC-41033502	286	T	NAS-IC-41033502	296 - 300	T

2. IDLL Test Criteria: The receiver and transmitter(s) will successfully pass the IDLL test case if the following conditions are met:

a. All non-segmented messages or individual message segments (of a segmented message) sent between the MDR and RIU are transmitted within one frame. (158)
b. The Flag Sequence field appears at the beginning and end of all frames and consists of one 0 bit followed by six contiguous 1 bits and one 0 bit. (159)
c. For all HDLC messages except the TEST Response message, the AD field provides the address of the unit to which the information sequence in the frame is sent. (160)
d. The CN field consists of one octet and is used to identify the frame type, either TEST or UI. (161)
e. For TEST Response messages, the AD field contains the address of the unit from which the information sequence in the frame is sent. (286)
f. The Poll/Final bit (bit 5) in the Control field is not used and is set to 0. (291)
g. In a UI frame, the I field contains a message. (162)
h. All UI frames are UI Command frames. (290)
i. The I field consists of an integral number of octets. (163)
j. The Frame Check Sequence field is a 16-bit field and used for frame error detection. (164)
k. The HDLC address for: an RIU is 01, a transmitter is 02, and a receiver is 03. (287).
l. The following requirement will be fulfilled by meeting the criteria listed above: FAA-E-2938, Shall #400.
m. MDR Transmitters encode the HDLC address as 02 for all HDLC Test Response messages to be delivered to the RIU. (296)
n. MDR Receivers encode the HDLC address as 03 for all HDLC Test Response messages to be delivered to the RIU. (297)
o. MDR Transmitters accept and process HDLC UI messages from the RIU with the HDLC address encoded as 02. (298)
p. MDR Receivers accept and process HDLC UI messages from the RIU with the HDLC address encoded as 03. (299)
q. The time between frames shall be filled with flag characters, per ISO 3309. (300)

3. IDLL Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

4. IDLL Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. IHFT Objectives: The objective of the IHFT test case is to verify that the MDR will conform to the HDLC frame timing requirement for transmissions between the MDR and RIU. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	404	T	NAS-IC-41033502	171	T

2. IHFT Test Criteria: The receiver and transmitter(s) will successfully pass the IHFT test case if the following is met:

   a. The timing and size of HDLC frame transmissions between the MDR and RIU (with the voice delay from start of first bit at the originator (MDR/RIU) to the reception of the last bit at the recipient (RIU/MDR), due to the HDLC frame transmission) does not exceed 3 ms. (171 and 404)

3. IHFT Test Approach: The T1 Framer will time stamp the HDLC messages. The RIU Simulator will then verify the time stamps.

4. IHFT Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. ILCF Objectives: The objective of the ILCF test case is to verify the MDR's ability to meet the link clearing requirements contained in NAS-IC-41033502. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	402	T	NAS-IC-41033502	169	T
NAS-IC-41033502	168	T	NAS-IC-41033502	257	T

2. ILCF Test Criteria: The receiver and transmitter(s) will successfully pass the ILCF test case if the following conditions are met:

a. While in the link initialized state, the initiator of the Link Clearing procedure sends a TEST Command message with a five-octet information field, the first four octets (octet 1 is MSB, octet 4 is LSB) containing all ONEs indicating a clear, followed by a one octet clearing cause code. (168)
b. The recipient of the link clearing confirms the clear by issuing a TEST Response with the first four octets set to all ONEs. (169)
c. Upon receipt of a valid TEST Response confirming the clear, the initiator clears the T1 timer, and both the MDR and RIU will be in the link inactive state. (257)
d. The following requirement will be fulfilled by meeting the above criteria: FAA-E-2938, Shall #402.

3. ILCF Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

4. ILCF Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. ILLI Objectives: The objective of the ILLI test case is to verify the MDR's ability to meet the link level initialization and maintenance requirements contained in NAS-IC-41033502. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	401	T	NAS-IC-41033502	238	T
FAA-E-2938	403	T	NAS-IC-41033502	165	T
FAA-E-2938	405	T	NAS-IC-41033502	166	T
FAA-E-2938	572 - 574	T	NAS-IC-41033502	210 through 216	T
FAA-E-2938	701	T	NAS-IC-41033502	218	T
NAS-IC-41033502	237	T			

2. ILLI Test Criteria: The receiver and transmitter(s) will successfully pass the ILLI test case if the following conditions are met:

a. The MDR supports the link initialization procedures and link level message structure defined in NAS-IC-41033502. (401 and 405)
b. Verify that the two states of operation are the link inactive state and link initialized state. (165)
c. The Link Initialization procedure consists of the RIU generating a Test Command to the MDR with a four octet (octet 1 is MSB, octet 4 is LSB) I field consisting of a sequence number starting at zero and incrementing by one with each retransmission. (166)
d. The MDR discards clearing TEST response frames after the expiration of the T1 timer. (572)
e. The MDR retransmits the clearing TEST command frame upon expiration of the T2 timer. (573)
f. The MDR rejects Control and Monitoring Message segments received after expiration of the T3 timer. (574)
g. The MDR limits the size of HDLC frames across the MDR/RIU link according to the N1 parameter. (403)
h. The T1 frame consists of 192 bits. Each frame is composed of one framing bit (the first bit) and twenty-four 8-bit time slots for data. The twenty-four 8-bit slots are organized as in Figure 3-82 of NAS-IC-41033502. (210 through 213)
i. The T1 line transmits at a rate of 8,000 T1 frames/s (1.544 Mbit/s). (214)
j. The T1 line uses Extended Super Frame formatting consisting of groups of 24 consecutive T1 frames. (215)
k. The eighth bit of every time-slot in every sixth T1 frame is used for data. (216)
l. Pulse density is accomplished using B8ZS method. (218)
m. Each data channel is capable of carrying data, control, monitoring and status information in the VDL Mode 3 and PCM Voice, control, monitoring and status information in the DSB-AM Mode. (237)
n. Allocation of time slots to channels are fixed for all T1 frames on a given link (i.e., for as long as a channel is in use, it occupies the same time slot numbers in each T1 frame that is generated). (238)

o. While in the link inactive state, the MDR ignores all UI-frame-based messages that are not MDR/RIU status messages. (701) *Note: This is a deviation from FAA-E-2938. The OCT test will be conducted for the link inactive state.*

3. <u>ILLI Test Approach</u>: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

The following T1 criteria will be verified by repeated link level connectivity to the MDR through the T1 interface: NAS-IC-41033502 Shall #210 through 216, 218, 237, 238 and 701. The following link level message structure criteria will be verified by repeated link level connectivity: FAA-E-2938, Shall #401, 403, and 405.

4. <u>ILLI Data Analysis Methods</u>: The results of the above testing will be logged within the controlling computer.

1. ILSM Objectives: The objective of the ILSM test case is to verify that the MDR meets the Link Status message requirements contained in the NAS-IC-41033502 and general message structure requirements. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	406*	T	NAS-IC-41033502	172*	T
FAA-E-2938	407*	T	NAS-IC-41033502	208	T
FAA-E-2938	408*	T	NAS-IC-41033502	258*	T
FAA-E-2938	415	T	NAS-IC-41033502	259*	T
FAA-E-2938	416	T	NAS-IC-41033502	260*	T

**Only partially fulfilled by this test cases. Also see IVBM, IDBM, IMBM, ISCM, IPVM, IRCM, IRMM, and ILSM.*

2. ILSM Test Criteria: The receiver and transmitters will successfully pass the ILSM test case if the following conditions are met:

a. The MDR shall support the capability to send/receive link status messages to/from the RIU (Message ID = 7) and encoded as in Figure 3-81 with the field descriptions in Table 3-15 in NAS-IC-41033502. (208, 406, 407, 408, and 415)
b. The link status message defines the status of the MDR or is used by the RIU to complete the link initialization. (416)
c. Each message exchanged across the data interface contains a one octet Message ID followed by the message. (172)
d. Bit fields are encoded such that the most significant bit of a field (or sub-field that crosses octet boundaries) is in the highest bit number position of the octet. (258)
e. For variable length bit fields that have a total length (LEN) that is not a multiple of 8, the most significant bit of the part-octet (remaining part of the field) at the end of the field are encoded in bit 8 of the last octet and the unused lower numbered bit(s) in the last octet shall be set to 0. (259 and 260)

3. ILSM Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

The following requirements are partially fulfilled by meeting the criteria of the lower level requirements of this test case: FAA-E-2938 Shall #406, 407, and 408 and NAS-IC-41033502 Shall #172, 258, 259, and 260.

4. ILSM Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. IMBM Objectives: The objective of the IMBM test case is to verify the MDR's ability to meet the Management-Burst message requirements. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	406*	T	NAS-IC-41033502	183	T
FAA-E-2938	407*	T	NAS-IC-41033502	258*	T
FAA-E-2938	408*	T	NAS-IC-41033502	259*	T
FAA-E-2938	410	T	NAS-IC-41033502	260*	T
FAA-E-2938	629	T	NAS-IC-41033502	265	T
NAS-IC-41033502	172*	T	NAS-IC-41033502	266	T
NAS-IC-41033502	180	T			

**Only partially fulfilled by this test case. Also see IVBM, IDBM, IMBM, ISCM, IPVM, IRCM, IRMM, and ILSM.*

2. IMBM Test Criteria: The receiver and transmitter(s) will successfully pass the IMBM test case if the following conditions are met:

a. The Management-Burst message is encoded as in Figure 3-77 and Table 3-10 of NAS-IC-41033502. The receiver sends these messages to the RIU (Message ID=2) and the transmitter receives these messages from the RIU. (180, 406, 407, 408, 410, and 629)
b. The Management-Burst STYPE field is per Table 3-10a of NAS-IC-41033502. (183)
c. The MB field is encoded with the most significant bit of each VDL3 12-bit Management Burst word placed in the highest unused bit number position in the octet. (265)
d. As Management Burst words cross octet boundaries, the most significant bit of the remaining 12-bit Management Burst word is placed in bit 8 of the next octet. (266)
e. Each message exchanged across the data interface contains a one octet Message ID followed by the message. (172)
f. Bit fields are encoded such that the most significant bit of a field (or sub-field that crosses octet boundaries) is in the highest bit number position of the octet. (258)
g. For variable length bit fields that have a total length (LEN) that is not a multiple of 8, the most significant bit of the part-octet (remaining part of the field) at the end of the field are encoded in bit 8 of the last octet and the unused lower numbered bit(s) in the last octet shall be set to 0. (259 and 260)

3. IMBM Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

The following requirements are partially fulfilled by meeting the criteria of the lower level requirements of this test case: FAA-E-2938 Shall #406, 407, and 408 and NAS-IC-41033502 Shall #172, 258, 259, and 260

4. IMBM Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. IMCP Objectives: The objective of the IMCP test case is to verify the MDR's ability to properly support all control parameters received from the RIU interface. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
NAS-IC-41033502	81	T	NAS-IC-41033502	125	T
NAS-IC-41033502	83	T	NAS-IC-41033502	127	T
NAS-IC-41033502	87	T	NAS-IC-41033502	129	T
NAS-IC-41033502	89	T	NAS-IC-41033502	131	T
NAS-IC-41033502	91	T	NAS-IC-41033502	135	T
NAS-IC-41033502	93	T	NAS-IC-41033502	137	T
NAS-IC-41033502	95	T	NAS-IC-41033502	139	T
NAS-IC-41033502	97	T	NAS-IC-41033502	251 through 254	T
NAS-IC-41033502	99	T	NAS-IC-41033502	272 through 274	T
NAS-IC-41033502	103	T	NAS-IC-41033502	294	T
NAS-IC-41033502	105	T	FAA-E-2938	454 through 467*	T
NAS-IC-41033502	107	T	FAA-E-2938	469 through 477*	T
NAS-IC-41033502	109	T	FAA-E-2938	479 through 482*	T
NAS-IC-41033502	111	T	FAA-E-2938	526	T
NAS-IC-41033502	113	T	FAA-E-2938	532*	T
NAS-IC-41033502	119	T	FAA-E-2938	583 through 584*	T
NAS-IC-41033502	121	T	FAA-E-2938	694*	T
NAS-IC-41033502	123	T			

** Only the portion of the requirement(s) referenced to NAS-IC-41033502*

2. IMCP Test Criteria: The receiver and transmitter(s) will successfully pass the IMCP test case if the following is met:

a. The MDR bit formats for each control parameter are as defined in NAS-IC-41033502, Sections 3.2.2.1.4.3.1.1 through 3.2.2.1.4.3.1.35 and as required by FAA-E-2938, Sections 3.2.3.2.1 through 3.2.3.2.34.

b. Rejection of all control parameters from other control interface(s) while a valid session is active on one control interface (526).

3. IMCP Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

During one control session of the MDR from the RIU interface, an attempt will be made to control the MDR from the MDT. Then the MDT will take control of the MDR and the RIU will attempt to command the MDR.

4. IMCP Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. IMMP Objectives: The objective of the IMMP test case is to verify that the attributes of the monitoring parameters sent from the MDR meet the requirements in NAS-IC-41033502. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
NAS-IC-41033502	2	T	NAS-IC-41033502	54	T
NAS-IC-41033502	4	T	NAS-IC-41033502	66	T
NAS-IC-41033502	8	T	NAS-IC-41033502	69	T
NAS-IC-41033502	12	T	NAS-IC-41033502	75	T
NAS-IC-41033502	14	T	NAS-IC-41033502	77	T
NAS-IC-41033502	16	T	NAS-IC-41033502	79	T
NAS-IC-41033502	18	T	NAS-IC-41033502	255 and 256	T
NAS-IC-41033502	20	T	NAS-IC-41033502	275 through 279	T
NAS-IC-41033502	24	T	NAS-IC-41033502	280 through 285	T
NAS-IC-41033502	26	T	NAS-IC-41033502	295	T
NAS-IC-41033502	28	T	FAA-E-2938	485 through 495*	T
NAS-IC-41033502	32	T	FAA-E-2938	497 through 511*	T
NAS-IC-41033502	34	T	FAA-E-2938	590 through 594*	T
NAS-IC-41033502	36	T	FAA-E-2938	597*	T
NAS-IC-41033502	38	T	FAA-E-2938	662 through 665*	T
NAS-IC-41033502	44	T	FAA-E-2938	668*	T
NAS-IC-41033502	48	T	FAA-E-2938	695*	T
NAS-IC-41033502	50	T			

** Only the portion of the requirement referenced to NAS-IC-41033502*

2. IMMP Test Criteria: The receiver and transmitter(s) will successfully pass the IMMP test case if the following is met:

   a. The MDR transmits each of the monitoring parameters with the bit formats defined for the parameter as defined in NAS-IC-41033502, Sections 3.2.2.1.4.3.2.1 through 3.2.2.1.4.3.2.44 and as required by FAA-E-2938, Sections 3.2.3.5.1 through 3.2.3.5.38.

3. IMMP Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

4. IMMP Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. IPVM Objectives: The objective of the IPVM test case is to verify the MDR's ability to receive and transmit PCM voice messages to the RIU. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	406*	T	FAA-E-2938	630	T
FAA-E-2938	407*	T	NAS-IC-41033502	172*	T
FAA-E-2938	408*	T	NAS-IC-41033502	191	T
FAA-E-2938	412	T	NAS-IC-41033502	258*	T
FAA-E-2938	435 and 436	T	NAS-IC-41033502	259*	T
FAA-E-2938	438 through 443	T	NAS-IC-41033502	260*	T
FAA-E-2938	447 through 450	T			

**Only partially fulfilled by this test case. Also see IVBM, IDBM, IMBM, ISCM, IPVM, IRCM, IRMM, and ILSM.*

2. IPVM Test Criteria: The receiver and transmitter(s) will successfully pass the IPVM test case if the following conditions are met:

a. The PCM-Voice message is encoded as illustrated in Figure 3-79 with the field descriptions shown in Table 3-12 of NAS-IC-41033502. The receiver sends these messages to the RIU (Message ID=4) and the transmitter receives these messages from the RIU. (191, 405, 406, 407, 412, and 630)
b. The MDR receiver handles the reception of PCM voice as defined in Section 3.2.2.1.1.2.1 and subsections of FAA-E-2938. (435, 436, and 438 through 443)
c. The MDR transmitter handles the transmission of PCM voice as defined in Section 3.2.2.2.1.2.1 and subsections of FAA-E-2938. (447 through 450)
d. Each message exchanged across the data interface contains a one octet Message ID followed by the message. (172)
e. Bit fields are encoded such that the most significant bit of a field (or sub-field that crosses octet boundaries) is in the highest bit number position of the octet. (258)
f. For variable length bit fields that have a total length (LEN) that is not a multiple of 8, the most significant bit of the part-octet (remaining part of the field) at the end of the field are encoded in bit 8 of the last octet and the unused lower numbered bit(s) in the last octet shall be set to 0. (259 and 260)

3. IPVM Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

The following requirements are partially fulfilled by meeting the criteria of the lower level requirements of this test case: FAA-E-2938 Shall #406, 407, and 408 and NAS-IC-41033502 Shall #172, 258, 259, and 260

4. IPVM Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. IRCM Objectives: The objective of the IRCM test case is to verify the MDR's ability to support the Radio Control message formats contained in NAS-IC-41033502. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	406*	T	NAS-IC-41033502	193 through 197	T
FAA-E-2938	407*	T	NAS-IC-41033502	258*	T
FAA-E-2938	408*	T	NAS-IC-41033502	259*	T
FAA-E-2938	413	T	NAS-IC-41033502	260*	T
FAA-E-2938	614	T	NAS-IC-41033502	292	T
NAS-IC-41033502	172*	T			

**Only partially fulfilled by this test case. Also see IVBM, IDBM, IMBM, ISCM, IPVM, IRCM, IRMM, and ILSM.*

2. IRCM Test Criteria: The receiver and transmitter(s) will successfully pass the IRCM test case if the following conditions are met:

a. The Radio Control message is encoded as defined in Figure 3-80 and Table 3-13 of NAS-IC-41033502. The MDR receives and responds to Radio Control messages from the RIU (Message ID=5). (193, 406, 407, 408, and 413)
b. The Radio Control message is segmented across the interface if the message exceeds the segmentation size, defined by the parameter N1. (194)
c. TSC field indicates one less than the total number of segments for a specific transaction (identified by the TID field). (195)
d. The SC field indicates the individual segment number for the transaction. (196)
e. A message is deemed valid by the receiving unit, if all segments are received in sequence prior to the expiration of the T3 timer. (197)
f. When the MDR detects an error, it reports back in the reply by setting the ER field to 1, and placing the error cause code in the first octet of the MSG field. (292 and 614)
g. Each message exchanged across the data interface contains a one octet Message ID followed by the message. (172)
h. Bit fields are encoded such that the most significant bit of a field (or sub-field that crosses octet boundaries) is in the highest bit number position of the octet. (258)
i. For variable length bit fields that have a total length (LEN) that is not a multiple of 8, the most significant bit of the part-octet (remaining part of the field) at the end of the field are encoded in bit 8 of the last octet and the unused lower numbered bit(s) in the last octet shall be set to 0. (259 and 260)

3. IRCM Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

The following requirements are partially fulfilled by meeting the criteria of the lower level requirements of this test case: FAA-E-2938 Shall #406, 407, and 408 and NAS-IC-41033502 Shall #172, 258, 259, and 260

4. IRCM Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. IRHT Objectives: The objective of the IRHT test case is to verify the MDR receiver's ability to meet the HDLC message timing requirements. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	417	T	FAA-E-2938	422	T
FAA-E-2938	418	T	FAA-E-2938	423	T
FAA-E-2938	419	T	FAA-E-2938	425	T
FAA-E-2938	420	T			

2. IRHT Test Criteria: The receiver will successfully pass the IRHT test case if the following conditions are met:

a. The MDR receiver complies with the HDCL Message Timing requirements in FAA-E-2938 Section 3.2.1.6.6 and subsections. (417 through 420, 422, 423, and 425)

3. IRHT Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

4. IRHT Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. IRLS Objectives: The objective of the IRLS test case is to verify that the MDR receiver properly transmits the link status word as required by NAS-IC-41033502. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
NAS-IC-41033502	149through 153	T			

2. IRLS Test Criteria: The receiver will successfully pass the IRLS test case if the following conditions are met:

a. The Receiver Link Status word comprises the fields specified in Table 3-4 of NAS-IC-41033502. (149)
b. The Status (S) bits are encoded as follows: (150)
 0 = Offline
 1 = Power Down (if exercised)
 2 = Power Up
 3 = Online
 4-5 = Reserved
 6 = Recovery
 7 = Fail.
c. The T bit is encoded as follows: (151)
 0 = MDR MAC cycle timing not locked to 6-second epoch
 1 = MDR MAC cycle timing locked to 6-second epoch.
d. The I bit is encoded as 1 if any invalid data was received from the RIU during the last MAC cycle, or 0 otherwise. (152)
e. The F bit is encoded as 1 if a T1 Frame Slip was detected on the link from the RIU, or 0 otherwise. (153)

3. IRLS Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

4. IRLS Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. IRMM Objectives: The objective of the IRMM test case is to verify the MDR's ability to support the Radio Monitoring message formats contained in NAS-IC-41033502. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	406*	T	NAS-IC-41033502	172*	T
FAA-E-2938	407*	T	NAS-IC-41033502	200 through 205	T
FAA-E-2938	408*	T	NAS-IC-41033502	258*	T
FAA-E-2938	414	T	NAS-IC-41033502	259*	T
FAA-E-2938	579	T	NAS-IC-41033502	260*	T
FAA-E-2938	580	T			

**Only partially fulfilled by this test cases. Also see IVBM, IDBM, IMBM, ISCM, IPVM, IRCM, IRMM, and ILSM.*

2. IRMM Test Criteria: The receiver and transmitter(s) will successfully pass the IRMM test case if the following conditions are met:

a. The Radio Monitoring message is encoded as defined in Figure 3-80 and Table 3-13 of NAS-IC-41033502. (200, 406, 407, 408 and 414)
b. The Radio Monitoring message is segmented across the interface if the message exceeds the segmentation parameter, defined by the parameter N1. (201)
c. The Radio Monitoring message TSC field indicates one less than the total number of segments for a specific transaction (identified by the TID field). (202)
d. The Radio Monitoring message SC field indicates the individual segment number for the transaction. (203)
e. A message is deemed valid by the receiver, if all segments are received in sequence prior to the expiration of the T3 timer. (204)
f. Monitoring messages generated by the MDR as a result of an Alert or Alarm threshold that has been exceeded, set the RR and TID fields to 0. (205)
g. The MDR replies to a Control request message (RR=1 per NAS-IC-41033502) with a Control Reply message (RR=0) containing the parameter setting actually enacted by the MDR. (579)
h. Rejected Control request messages contain the original parameter setting with an error code indicating the reason for rejection. (580)
g. Each message exchanged across the data interface contains a one octet Message ID followed by the message. (172)
h. Bit fields are encoded such that the most significant bit of a field (or sub-field that crosses octet boundaries) is in the highest bit number position of the octet. (258)
i. For variable length bit fields that have a total length (LEN) that is not a multiple of 8, the most significant bit of the part-octet (remaining part of the field) at the end of the field are encoded in bit 8 of the last octet and the unused lower numbered bit(s) in the last octet shall be set to 0. (259 and 260)

3. IRMM Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

The following requirements are partially fulfilled by meeting the criteria of the lower level requirements of this test case: FAA-E-2938 Shall #406, 407, and 408 and NAS-IC-41033502 Shall #172, 258, 259, and 260

4. IRMM Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. ISCM Objectives: The objective of the ISCM test case is to verify the MDR receivers ability to support the Sync Search Control Message formats contained in NAS-IC-41033502. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	406*	T	NAS-IC-41033502	258*	T
FAA-E-2938	407*	T	NAS-IC-41033502	259*	T
FAA-E-2938	408*	T	NAS-IC-41033502	260*	T
FAA-E-2938	411	T	NAS-IC-41033502	267	T
NAS-IC-41033502	172*	T	NAS-IC-41033502	268	T
NAS-IC-41033502	186	T			

**Only partially fulfilled by this test case. Also see IVBM, IDBM, IMBM, ISCM, IPVM, IRCM, IRMM, and ILSM.*

2. ISCM Test Criteria: The receiver will successfully pass the ISCM test case if the following conditions are met:

a. The Sync Search Control message is encoded as defined in Figure 3-78 and Table 3-11 of NAS-IC-41033502. The Search Sync control message is from the RIU (Message ID=3) to the MDR receiver. (186. 406, 407, 408, and 411)
b. The Synchronization Header Type (STYPE) field is encoded per Table 3-10a of NAS-IC-41033502. (267)
c. The NGW field shall indicate the number of (24,12) Golay words in the received burst to be decoded by the MDR if synchronization is achieved within the search window. (268)
d. Each message exchanged across the data interface contains a one octet Message ID followed by the message. (172)
e. Bit fields are encoded such that the most significant bit of a field (or sub-field that crosses octet boundaries) is in the highest bit number position of the octet. (258)
f. For variable length bit fields that have a total length (LEN) that is not a multiple of 8, the most significant bit of the part-octet (remaining part of the field) at the end of the field are encoded in bit 8 of the last octet and the unused lower numbered bit(s) in the last octet shall be set to 0. (259 and 260)

3. ISCM Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

The following requirements are partially fulfilled by meeting the criteria of the lower level requirements of this test case: FAA-E-2938 Shall #406, 407, and 408 and NAS-IC-41033502 Shall #172, 258, 259, and 260

4. ISCM Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. ISTC Objectives: The objective of the ISTC test case is to verify that the MDR will conform to the various system timing requirements for MDR/RIU interface. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	14 through 16	T	NAS-IC-41033502	247	T
FAA-E-2938	397	T	NAS-IC-41033502	269	T
FAA-E-2938	399	T	NAS-IC-41033502	270	T
FAA-E-2938	529	T	NAS-IC-41033502	271	T
FAA-E-2938	623 through 626	T	NAS-IC-41033502	293	T
NAS-IC-41033502	246	T			

2. ISTC Test Criteria: The receiver and transmitter(s) will successfully pass the ISTC test case if the following conditions are met:

a. The LBACs for the transmitter are in accordance with Section 3.2.1.2.2.3 of FAA-E-2938. (14, 15, 16)
b. The LBACs for the receiver are in accordance with Section 3.2.1.2.2.4 of FAA-E-2938. (14, 397, 399, 623, 624, 625, and 626)
c. The system timing between the MDRs and RIU are in accordance with Section 3.2.2.7.2 of NAS-IC-41033502. (246, 247, 269, 270, 271, and 293)
d. The MDR receiver and transmitter receive epoch timing from the timing channel and voice/data/signaling communications from the HDLC data channel are in accordance with NAS-IC-41033502. (529)

3. ISTC Test Approach: The following approaches will be used to verify the above criteria:

a. For some criteria, the T1 Framer will generate a timing signal for the RF Testbed and the RF Testbed will verify the performance.
b. For some criteria, the T1 Framer will require commands from the RIU Simulator and provide signals to the RF Testbed.
c. For the remaining criteria, a simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

4. ISTC Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. ITHT Objectives: The objective of the ITHT test case is to verify the MDR transmitter's ability to meet the HDLC message sequencing and timing requirements. The following requirements will be evaluated by this test:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	637 through 647	T			

2. ITHT Test Criteria: The transmitters will successfully pass the ITHT test case if the following are met:

a. The MDR transmitter receives HDLC message timing and sequencing as specified in FAA-E-2938 Section 3.2.1.6.7. (637 through 647)

3. ITHT Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

4. ITHT Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. ITLR Objectives: The objective of the ITLR test case is to verify that the MDR conforms to the following T1 line requirement contained in NAS-IC-41033502:

Document	Shall #	Method	Document	Shall #	Method
NAS-IC-41033502	219	T			

2. ITLR Test Criteria: The receiver and transmitter(s) will successfully pass the ITLR test case if the following conditions are met:

   a. The T1 port is able to operate over any cable length from 0 to 6,000 ft. (219)

3. ITLR Test Approach: The criteria will be tested by inserting to 2 T1-1310 Line Simulators for a total of 2620 feet. A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR, with the Line Simulators inserted.

4. ITLR Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. ITLS Objectives: The objective of the ITLS test case is to verify that the MDR transmitter properly transmits the link status word as required by NAS-IC-41033502. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
NAS-IC-41033502	140 - 144	T	NAS-IC-41033502	146 - 148	T

2. ITLS Test Criteria: The transmitters will successfully pass the ITLS test case if the following conditions are met:

a. The MDR transmitter Status word comprises the fields specified in Table 3-3 of NAS-IC-41033502. (140)
b. The Status (S) bits are encoded as follows: (141)
   0 = Offline
   1 = Power Down (if exercised)
   2 = Power Up
   3 = Online
   4-5 = Reserved
   6 = Recovery
   7 = Fail.
c. The T bit is encoded as follows: (142)
   0 = MDR MAC cycle timing not locked to 6-second epoch
   1 = MDR MAC cycle timing locked to 6-second epoch.
d. The I bit is encoded as 1 if any invalid data was received from the RIU during the last MAC cycle, or 0 otherwise. (143)
e. The F bit is encoded as 1 if a T1 Frame Slip was detected on the link from the RIU, or 0 otherwise. (144)
f. The M bit is encoded as 1 if any M-channel data within the last MAC cycle was not received from the RIU in time to be modulated, or 0 otherwise. (146)
g. The V bit is encoded as 1 if any Voice Channel data within the last MAC cycle was not received from the RIU in time to be modulated, or 0 otherwise. (147)
h. The D bit is encoded as 1 if any Data Channel data within the last MAC cycle was not received from the RIU in time to be modulated, or 0 otherwise. (148)

3. ITLS Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

4. ITLS Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. ITSA Objectives: The objective of the ITSA test case is to verify that the MDR conforms to the following T1 time slot requirement contained in NAS-IC-41033502. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-2938	427	T	NAS-IC-41033502	226	T

2. ITSA Test Criteria: The receiver and transmitters will successfully pass the ITSA test case if the following conditions are met:

a. The default data channel is channel 1 (slots 5 - 8). (226)
b. The MDR is configurable to use any of one of the five data channels plus the timing channel (slots 1 and 2). (427)

3. ITSA Test Approach: The RIU Simulator and T1 Framer will allocate the default channel (channel 1, slots 5-8), or any other channels, as the channel in use. The Offeror will configure the MDR accordingly. The proper operation of the MDR will be verified. The HP 37711A T1 Test Set will be used to verify the default channel (channel in use) by checking for activity on all expected time slots.

4. ITSA Data Analysis Methods: The results of the above testing will be logged within the controlling computer.

1. ITTC Objectives: The objective of the ITTC test case is to verify that the MDR conforms to the T1 time channel requirements contained in the NAS-IC-41033502. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	428	T	FAA-E-2938	432	T
FAA-E-2938	429	T	FAA-E-2938	433	T
FAA-E-2938	430	T	FAA-E-2938	434	T

2. ITTC Test Criteria: The receiver and transmitters will successfully pass the ITTC test case if the following conditions are met:

a. The MDR supports the T1 timing channel in accordance with NAS-IC-41033502. (428)
b. The MDR loop-backs to the RIU the information contained in the Timing Channel every T1 frame to allow the RIU to measure the round trip delay through the telecommunications path between the RIU and MDR. (429)
c. The looped back Timing Channel is delayed in the MDR in accordance with FAA-E-2938, Section 3.2.1.7.2 c). (430)
d. The MDR derives all necessary VDL Mode 3 TDMA timing information using the Timing Channel, T1 frame timing, and the MAC Timing Offset Correction messages provided by the RIU. (432)
e. The MDR incorporates the necessary corrections to compensate for internal delays within the radio (e.g., processing delays, FIR filter delays, modulation delays, and demodulation delays). (433)
f. The MDR is responsible for detecting a repeated or skipped frame error condition and reporting it to the RIU. (434)

3. ITTC Test Approach: The following test approaches will be used to evaluate the above criteria:

a. Proper operation of the MDR will verify this requirement, also we will verify the timing channel requirements by using HP 37711A T1 Test Set. Using HP Test Set we can look at each individual time slot or all the time slots and verify the timing counter in the slots 1 and 2.

b. The T1 Framer will keep track of the data sent to MDR and looped back with a difference of the constant delay of the MDR.

c. Using the T1 Framer line input and output test points in conjunction with an oscilloscope (e.g., Tektronix TEKScope) measure the actual MDR delay (frame delay plus processing and buffering delays). The T1 Framer uses the looped back information from MDR to determine the number of frame delays inside the MDR.

d. The RIU Simulator sends MAC timing offset correction messages, then will verify the message processing at the expected time.

e. The T1 Framer monitors the MDR delay during its operation to verify the constant delay.

f. The RIU Simulator commands the T1 Framer to repeat or skip a counter, and verify that the MDR generates a correct message

4. <u>ITTC Data Analysis Methods</u>: The results of the above testing will be logged within the controlling computer.

1. IVBM Objectives: The objective of the IVBM test case is to test the voice burst messages that are sent from the MDR to the RIU. The following requirements will be evaluated by this test case:

Document	Shall #	Method	Document	Shall #	Method
FAA-E-2938	406*	T	NAS-IC-41033502	176	T
FAA-E-2938	407*	T	NAS-IC-41033502	258*	T
FAA-E-2938	408*	T	NAS-IC-41033502	259*	T
FAA-E-2938	568	T	NAS-IC-41033502	260*	T
FAA-E-2938	627	T	NAS-IC-41033502	261	T
NAS-IC-41033502	172*	T	NAS-IC-41033502	262	T

**Only partially fulfilled by this test cases. Also see IVBM, IDBM, IMBM, ISCM, IPVM, IRCM, IRMM, and ILSM.*

2. IVBM Test Criteria: The receiver and transmitter(s) will successfully pass the IVBM test case if the following conditions are met:

a. The Voice-Burst message is encoded as defined in Figure 3-75 and Table 3-8 of NAS-IC-41033502. The MDR transmitter receives the message from the RIU (Message ID=0) and the MDR receiver sends the message to the RIU. (176, 406, 407, 408, 568, and 627)
b. The TOA/TOT field is the same value for all Voice-Burst message segments related to the same VDL3 voice burst. (261)
c. VDL3 Voice burst D8PSK symbols are mapped to Voice-Burst message Voice Frame (VF) octets as specified in Table 3-8a of NAS-IC-41033502. (262)
d. Each message exchanged across the data interface contains a one octet Message ID followed by the message. (172)
e. Bit fields are encoded such that the most significant bit of a field (or sub-field that crosses octet boundaries) is in the highest bit number position of the octet. (258)
f. For variable length bit fields that have a total length (LEN) that is not a multiple of 8, the most significant bit of the part-octet (remaining part of the field) at the end of the field are encoded in bit 8 of the last octet and the unused lower numbered bit(s) in the last octet shall be set to 0. (259 and 260)

3. IVBM Test Approach: A simulation test scenario file provides the input used by the RIU Simulator to control the T1 Framer and drive the interface to the MDR. The RIU Simulator acts as a repository for all data sent across the T1 interface.

The following requirements are partially fulfilled by meeting the criteria of the lower level requirements of this test case: FAA-E-2938 Shall #406, 407, and 408 and NAS-IC-41033502 Shall #172, 258, 259, and 260

4. IVBM Data Analysis Methods: The results of the above testing will be logged within the controlling computer.